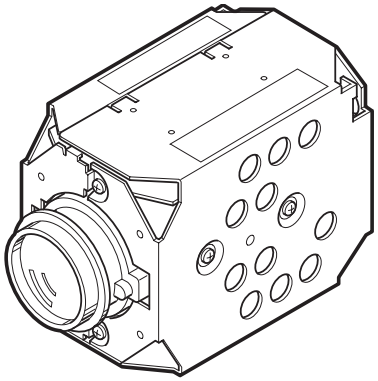
HITACHI

SM8303

VK-S454R
VK-S454ER

SERVICE MANUAL



SPECIFICATIONS AND PARTS ARE SUBJECT TO CHANGE FOR IMPROVEMENT

COLOR VIDEO CAMERA

August 2003 Digital Media Division

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1 Safety Precaution for Repair

1-1 Cautions

PRODUCT SAFETY NOTICE

Many electrical and mechanical parts have special safety-related characteristics. These are often not evident from visual inspection nor can the protection afforded by them necessarily be obtained by using replacement components rated for a higher voltage, wattage, etc. Replacement parts which have these special safety characteristics are identified in this Service Manual. Electrical components having such features are identified by marking with a ⚠ on the schematics and the parts list in this Service Manual. The use of a substitute replacement component which does not have the same safety characteristics as the HITACHI recommended replacement one, shown in the parts list in this Service Manual, may create shock, fire, or other hazards. Product safety is continuously under review and new instructions are issued from time to time. For the latest information, always consult the current HITACHI Service Manual. A subscription to, or additional copies for, HITACHI Service Manual may be obtained at a nominal charge from HITACHI SALES CORPORATION.

1-2 Electrostatic Protection Measures

Semiconductor components can be damaged by static electricity charged on clothes, human body, etc. Take great care when handling components to avoid electrostatic damage, and perform servicing in an environment where grounding is complete.

(1) Grounding work bench (Fig. 1-2-1)

Lay out an antistatic mat on work bench, and then use the ground plate to ground the work bench.

(2) Grounding human body (Fig. 1-2-2)

Use an antistatic wrist strap to discharge any static electricity charged on the body. Also, use a tester for wrist strap to make sure that the wrist strap is working normally. Note, however, that static electricity charged on clothes will not be discharged by wrist strap: Therefore do not allow your clothes to touch the semiconductor components.

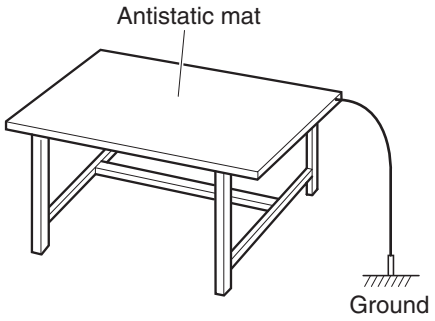


Fig. 1-2-1 Grounding Work Bench

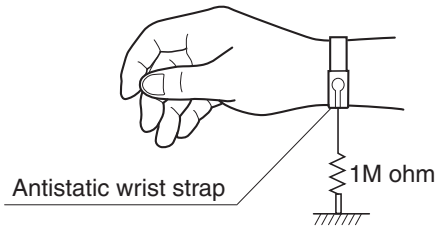


Fig. 1-2-2 Grounding Human Body

1-3 Lead-Free Solder

The printed circuit board that uses lead-free solder is adopted. To protect the global environment, use the recommended lead-free solder also during servicing.
Read and observe the following before soldering:

Caution
ALWAYS wear protective goggles during soldering so that no solder smoke or scattered solder enters the eye. Lead-free solder may scatter at high temperatures of 600°C.

(1) Identification of circuit boards that use lead-free solder

"F" is stamped or noted with pattern letter on circuit boards that use lead-free solder.

(2) Characteristics of lead-free solder

The components of lead-free solder used are as follows. The melting point of lead-free solder is 30-40°C higher than that of lead based solder:

Point to be soldered	Composition of alloy (wt%)
For reflow	Solder paste: Sn-3Ag-0.5Cu
For dip	Bar solder: Sn-0.6Cu

Melting temperature: Approx. 220°C

(3) Lead-free solder for servicing

Use the following lead-free solder for servicing:
Recommended lead-free solder and composition of alloy (wt%): Sn-3.0Ag-0.5Cu or equivalent

Information:
For composition of alloy, Sn is tin; Ag is silver; Cu is copper; Bi is bismuth; Pb is lead.

(4) Soldering iron for servicing

The temperature of soldering iron tip must be adjusted according to the points to be soldered: Use an antistatic soldering iron with thermal control function.
When removing components, take care not to damage any surrounding component or pattern. When attaching components, observe the heating time in the following table so that the components are not destroyed by heat.

Tip temperatures for different soldering points:

Point to be soldered	Tip temperature
Surface-mounted (chip) parts [other than those shown below]	320 ± 30°C [heating time: less than 5 seconds]
Surface-mounted (chip) parts [for DVD cameras, cellular phones only]	350 ± 10°C [heating time: less than 3 seconds]
Discrete parts	380 ± 30°C
Chassis, metal shield, etc.	420 ± 30°C

(5) Cautions when using lead based solder

It is recommended that you use lead-free solder when servicing, but it is also possible to service using lead based solder. However, if lead based solder is used for servicing, take care with the following:

1) Before using lead based solder, remove the lead-free solder completely from the point to be soldered.
2) For additional soldering for repair, set the soldering iron tip temperature for lead-free solder, mix lead based solder and lead-free solder sufficiently. Do not perform any repair using the bare soldering iron tip without adding solder, since it will cause secondary failure due to lack of strength.

1-4 Notes When Using Service Manual

(1) Value units used in parts list

Certain symbols are indicated as shown below for value units of resistors, capacitors and coils in parts list. When you read them, note the following regular indications:

Parts	Indication in list	Regular indication
Resistor	KOHM	kΩ
Capacitor	UF	μF
	PF	pF
Coil	UH	μH
	MH	mH

(2) Values in schematic diagrams

The values, dielectric strength (power capacitance) and tolerances of the resistors (excluding variable resistors) and capacitors are indicated in the schematic diagrams using abbreviations. Certain symbols are indicated for value units: When you read them note the regular indications in tables below:

[Resistors]

Item	Indication
Value	No indication ..... Ω K ..... kΩ M ..... MΩ
Tolerance	No indication ..... ±5% (All tolerances other than ±5% are indicated in schematic diagrams)
Power capacitance	No indication ..... 1/8W (1/16 W for leadless resistors with no indication) All capacitances other than the above are indicated in schematic diagrams.

[Capacitors]

Item	Indication
Value	No indication ..... μF P ..... pF
Dielectric strength	No indication ..... 50V (All dielectric strengths other than 50 V are indicated in schematic diagrams)

[Coils]

Item	Indication
Value	μ ..... μH m ..... mH

(3) Identifications of sides A/B in circuit board diagrams

1) Board with a pattern on one side and parts on both sides:

Side A: Shows discrete parts, viewed from the pattern side.

Side B: Shows leadless parts, viewed from the pattern side.

2) Board with patterns on both sides and parts on both sides:

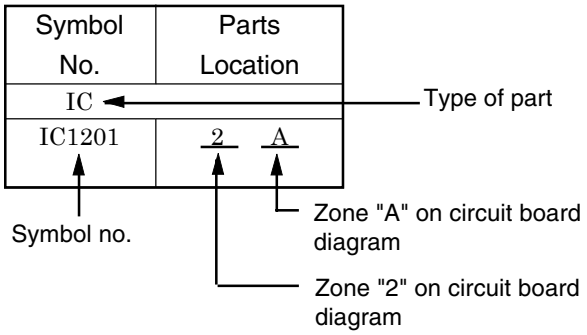
Side A: Shows parts and patterns which can be seen when the case is opened.

Side B: Shows parts and the pattern on the back of side A.

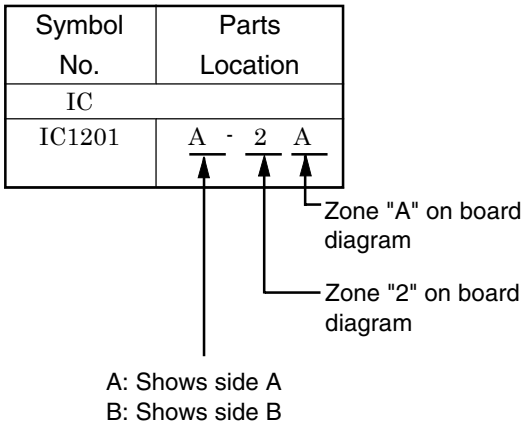
(4) Table for indexing locations of parts

This table shows locations of each part on circuit board diagrams. The locations are indicated using the guide scales on the external lines of diagrams.

1) One diagram indicated for each board



2) Two diagrams indicated for each board



2 General Description

2-1 Overview

VK-S454R/S454ER is a color chassis video camera: All these models incorporate an optical 23-power compact zoom lens.
The signal process circuit is equipped with a digital signal processor (D.S.P.6) that is the same as that of VK-S454/S454E.
The external appearance is identical to VK-S454/S454E.

2-1-1 Servicing method

Table 2-1-1 shows the method for servicing each circuit board.
Refer to "4 Troubleshooting" for the method of judging defects in each circuit board.

Information:
These servicing methods are subject to change without notice for the purpose of facilitating service procedures.

Table 2-1-1 Circuit Board Servicing Method

Circuit board	Servicing method
CSR circuit board	Component replacement.
SP circuit board	
PC circuit board	Component replacement or Circuit board assembly replacement (Order format).*1

*1: Since IC1121 mounted on the PC circuit board is CSP type, replacement is not possible: Replace the whole PC circuit board when IC1121 becomes faulty. Other components on the PC circuit board can be replaced.

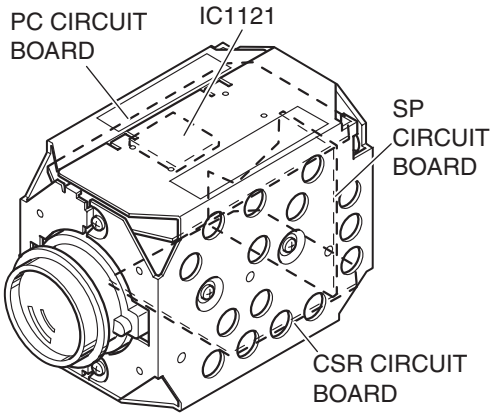


Fig. 2-1-1 Locations of Circuit Boards

2-2 Features

Progressive Scan CCD Image Sensor

The VK-S454R/S454ER has a high-performance 1/4-inch progressive scan CCD.

Wide Dynamic Range

A wide dynamic range is achieved by the progressive synthesis function, which records an image at a shutter speed suitable for brighter object and another image at a shutter speed suitable for darker object, then and synthesizes the two images, thereby reproducing a clear picture.

Removable IR Cut Filter

The IR cut filter that is fixed on other video cameras can be detached in low illumination. Removing the IR cut filter in low illumination will make it possible to use the infrared rays as a light source, so recording even in 0.02 lx will be possible.

Built-in Optical Power Zoom Lens

A highly reliable optical 23-power zoom lens is mounted, and it is equipped with auto-focus, auto iris and removable IR cut filter functions.

12-Power Digital Zoom Function

The 12-power digital zoom, combined with the 23-power optical zoom, makes possible up to 276-power zooming.

Remote Control via RS-232C

Focus, iris and zoom can be remotely operated via RS-232C.

External Synchronization with AC-Line Pulse Signal

This chassis camera is compatible with external sync using AC-line pulse signal, as well as with internal sync.

2-3 Specifications

The specifications in shaded columns are different from those of previous models.

Design and specifications are subject to change without notice.

Item			VK-S454R/S454ER
Signal Format			VK-S454R: NTSC VK-S454ER: PAL
Scanning System			2:1 Interlacing
Scanning Frequency	Horizontal		VK-S454R: 15.734 kHz VK-S454ER: 15.625 kHz
	Vertical		VK-S454R: 59.94 Hz VK-S454ER: 50 Hz
Image Sensor			1/4-inch CCD
	Total Pixels		VK-S454R: 758 (H) × 504 (V), 380k VK-S454ER: 758 (H) × 592 (V), 450k
	Effective Pixels		VK-S454R: 724 (H) × 494 (V), 360k VK-S454ER: 724 (H) × 582 (V), 420k
Lens	Focal Length		f = 3.6 - 82.8 mm
	Angle of View		Horizontal 54°(Wide), 2.5°(Tele)
	F-Value		F1.6 (Wide) - F3.7 (Tele)
	Min. Distance		1.0m (Tele), 0.01m (Wide)
	Removable IR cut filter (IRcf) Function		Provided
Signal Processing Circuit			DSP6
Sync. System			Internal/External
Camera Functions (Control through RS-232C)	Optical Zoom		Wide* - Tele 23× (Zoom speed: 4.2s*/5.8s)
	Digital Zoom		Off*/On (Up to 12×)
	Video Focus		Auto*/Manual (Near - Far/Fix)
	White Balance		Auto*/Manual (Red/Blue Gain: Up-Down/Fix)
	Digital Slow Shutter (DSS)		VK-S454R: 1/2 - 1/60s VK-S454ER: 1/1.5 - 1/50s
	Shutter Speed	Pro-AE mode (Auto)	VK-S454R: 1/60 - 1/4000s VK-S454ER: 1/50 - 1/4000s
		Pro-AE+* mode (Pro-AE + DSS)	VK-S454R: 1/2 - 1/4* - 1/4000s VK-S454ER: 1/1.5 - 1/3* - 1/4000s
		Pro-AER mode (Pro-AE + IRcf)	VK-S454R: 1/60 - 1/4000s VK-S454ER: 1/50 - 1/4000s
		Pro-AER+ mode (Pro-AE+ + IRcf)	VK-S454R: 1/2 - 1/4 - 1/4000s VK-S454ER: 1/1.5 - 1/3 - 1/4000s
		Manual	VK-S454R: Shutter priority (1/2 - 1/4000s)/ Exposure priority (F1.6 - F34)/ AGC priority (0 - 27dB) VK-S454ER: Shutter priority (1/1.5 - 1/4000s)/ Exposure priority (F1.6 - F34)/ AGC priority (0 - 27dB)
	Removable IR cut filter (IRcf)		Auto*/Manual (Off/On)
	Wide Dynamic Range (WDR)		Off*/On (Auto/Manual)
	Reverse		Off*/On
	Mirror		Off*/On

*: Default settings

Item		VK-S454R/S454ER
Camera Functions (Control through RS-232C)	Iris	Auto*
	Privacy Zone Masking	Off/On* (2 zone 2-D/8 zone 3-D)
	Scene Memory (Freeze)	Off*/On
	Communication Speed of RS-232C	Selective (4.8k*/9.6k/19.2k/38.4/57.6k bps)
	Position Preset	No-Trace preset/Trace preset (Memory: max. 111 position)
Horizontal Resolution		More than 470 TV lines
Luminance S/N Ratio		More than 50dB
Sensitivity	Pro-AE mode (1/60s or 1/50s, F1.6, AGC gain: 28.0dB)	3.0 lx
	Pro-AE+* mode (1/4s or 1/3s)	0.2 lx
	Pro-AER+ mode (IRcf: Off*)	0.02 lx
Video output		Composite: 1.0 ± 0.2Vp-p
Supplied Voltage		9 V - 12 V DC ± 0.5 V
Power Requirement		4.7 W (When suppling 9 V DC)
Operating Temperature		0 - 60° (Recommended: 0 - 40°)
Operating Humidity		10 - 90%
Dimensions		50 (W) × 60 (H) × 89.5 (D) mm
Weight		Approx. 230g

*: Default settings

2-4 Comparison from Previous Models

←— : Same as on left

Item		VK-S454R/S454ER	VK-S454/S454E
Image Sensor		1/4-inch CCD	←—
	Total Pixels	VK-S454R: 758 (H) × 504 (V), 380k	VK-S454: ←—
		VK-S454ER: 758 (H) × 592 (V), 450k	VK-S454E: ←—
	Effective Pixels	VK-S454R: 724 (H) × 494 (V), 360k	VK-S454: ←—
		VK-S454ER: 724 (H) × 582 (V), 420k	VK-S454E: ←—
Lens	Focal Length	f = 3.6 - 82.8 mm	←—
	Angle of View	Horizontal 54°(Wide), 2.5°(Tele)	←—
	F-Value	F1.6 (Wide) - F3.7 (Tele)	←—
	Min. Distance	1.0m (Tele), 0.01m (Wide)	←—
	Removable IR cut filter (IRcf) Function	Provided	←—
Signal Processing Circuit		DSP6	←—
Sync. System		Internal/External	←—
Camera Functions (Control through RS-232C)	Optical Zoom	23× (Zoom speed: 4.2s/5.8s)	←—
	Digital Zoom	Off/On (Up to 12×)	←—
	White Balance	Auto/Manual (Red/Blue Gain: Up-Down/Fix)	←—
	Shutter Speed	VK-S454R: 1/2 - 1/4 - 1/4000s	VK-S454: ←—
		VK-S454ER: 1/1.5 - 1/3 - 1/4000s	VK-S454E: ←—
	Removable IR cut filter (IRcf)	Auto/Manual (Off/On)	←—
	Wide Dynamic Range (WDR)	Off/On (Auto/Manual)	←—
	Reverse	Off/On	←—
	Mirror	Off/On	Not Provided
	Iris	Auto	←—
	Privacy Zone Masking	Off/On (2 zone 2-D/8 zone 3-D)	Off/On (2 zone 2-D)
	Scene Memory (Freeze)	Off/On	←—
	Communication Speed of RS-232C	Selective (4.8k/9.6k/19.2k/38.4/57.6k bps)	Selective (2.4k/4.8k/9.6k bps)
	Position Preset	No-Trace preset/Trace preset (Memory: max. 111 position)	Not Provided
Horizontal Resolution		More than 470 TV lines	←—
Luminance S/N Ratio		More than 50dB	←—
Sensitivity	Pro-AE mode	3.0 lx	←—
	Pro-AE+* mode	0.2 lx	←—
	Pro-AER+ mode	0.02 lx	←—
Supplied Voltage		9 V - 12 V DC ± 0.5 V	9 V DC ± 0.5 V
Power Requirement		4.7 W (When suppling 9 V DC)	4.6 W
Dimensions		50 (W) × 60 (H) × 89.5 (D) mm	←—
Weight		Approx. 230g	←—

2-5 Comparison of Main Control ICs

←— : Same as on left

Item	VK-S454R/S454ER		VK-S454/S454E	
Image Sensor	VK-S454R: ICX216AN	(IC1001)	VK-S454: ←—	
	VK-S454ER: ICX217AN	(IC1001)	VK-S454E: ←—	
Sensor Drive	µPD16510GR	(IC1002)	←—	
Buf.	HD74AC244	(IC1003)	←—	
CDS AGC & A/D Conv.	HD49325BF	(IC1101)	HD49325BHF	(IC1101)
Camera DSP	HG75C015ABT	(IC1121)	←—	
SD RAM	W986432DH-7	(IC1150)	µPD456323G5-A10BL-9JH	(IC1150)
Inv.	TC7SHU04FU	(IC1171)	←—	
Clock Gen.	MJU6321P	(IC1173)	←—	
Camera µP	HD6432238RN46FA	(IC1201)	HD6432238RN33FA	(IC1201)
Adj. EEPROM	BA9016RFV	(IC1202)	Not provided	
Reset EEPROM	BA9016RFV	(IC1250)	X25097V1-2.7	(IC1250)
Reset Pulse Gen.	RN5VD27AA	(IC1251)	RN5VD27AA	(IC1251)
			TC7S08FU	(IC1206)
Zoom Motor Drive	TB6512AF	(IC1301)	MPC17AT85VMEL	(IC1301)
Focus Motor Drive	TB6512AF	(IC1302)	MPC17AT85VMEL	(IC1302)
IR Motor Drive	TB6512AF	(IC1380)	MPC17AT85VMEL	(IC1380)
F.Det./Iris Drive	µPD5023GS-147-GJG	(IC1351)	←—	
PWM	TL1464IPT	(IC1501)	←—	
7.2V Reg.	PQ20WZ51	(IC1502)	Not provided	
Y/C Mix. & Video Amp	BA7665FS	(IC1601)	BA7664FV	(IC1601)
Level Shift	SN74AHCT125PW	(IC1602)	HD74HCT125T	(IC1602)
VCO/Phase Compa.	74VHC4046MTCX	(IC1603)	←—	
FV Pulse Gen.	SN74AHC1G08HDCK	(IC1604)	TC7S08	(IC1604)
Inv.	Not provided		TC7SHU04FU	(IC1605)
NTSC/PAL Switch	Not provided		NJM2533V	(IC1606)

2-6 List of Abbreviations and Terms for Surveillance System

Index	Abbreviation/ Term	Explanation
A	ANSI	American National Standard Institute: This organization establishes industrial product specifications for US.
	ATA	AT Attachment interface: Formal standard of IDE standardized by ANSI.
	ATA card	A kind of PC card. It incorporates a flash memory and hard disk: The format of connecting to PC conforms to the ATA standard.
C	Category	Division of twisted pair cables for communications depending on the frequency bandwidth. Categories 1-6 are available.
	Category 5	Twisted pair cable for communications whose frequency bandwidth is 100 MHz.
	CCTV	Closed Circuit Television: System for sending video signals to subscribers only.
	CF	See "Compact Flash".
	C mount	Type of lens mount for video cameras. A mount with flange back of 17.526 mm is referred to as a C mount.
	Compact Flash	Abbreviated and referred to as CF. Compact memory card, 36.4 mm long × 42.8 mm wide × 3.3 mm thick.
	CS mount	Type of lens mount for video cameras. A mount with flange back of 12.5 mm is referred to as a CS mount.
	CSP	Chip Scale Package or Chip Size Package: This IC was made compact by arranging pins under the package.
D	Daisy chain	To connect multiple devices together.
	D-SUB	A "D"-shaped trapezoidal connector.
E	EIA	Electronic Industries Alliance: This US electronic industrial organization oversees the electronic industry in US and standardizes various technologies and techniques.
	EIAJ	See "JEITA".
	Ethernet	Standard for communication format established by IEEE: This specifies the transmission rate, cable used and data exchange format. 10Base-T and 100Base-TX are also included in this standard.
F	Flange Back	Distance from the lens installation surface to recording surface of image sensor.
H	Hard Disk Drive	Abbreviated and referred to as HDD. This device uses a motor to rotate at high speed a disk coated with magnetic substance on its surface, and brings a magnetic head to the disk to read and write data.
	HDD	See "Hard Disk Drive".
I	IDE	Integrated Device Electronics: One of the formats for connecting PC and hard disk that was established by hard disk manufacturers. ANSI currently refers to it as the ATA standard.
	IEEE	Institute of Electrical and Electronic Engineers in US: The world largest institute related to electronics; has over 320,000 members in more than 130 countries in the world.
	Interlaced CCD Sensor	This CCD image sensor scans an image twice to create a one-image signal. It scans roughly once and then interpolates between first scanning lines the second time to interlace the image.
	IR	Infrared Ray.
J	JEIDA	See "JEITA".
	JEITA	Japan Electronics and Information Technology Industries Association: came into existence when JEIDA (Japan Electronic Industry Development Association) merged with EIAJ (Electronic Industries Association of Japan) in November, 2000.
	JPEG	Joint Photographic Expert Group: International standard format for compressing still images.
L	LAN	Local Area Network: A network within a limited area, such as in company or school.

Index	Abbreviation/ Term	Explanation
M	MPEG	Moving Picture Experts Group: Standard related to compression of video (movie) and audio. There are four types of MPEG - MPEG1, MPEG2, MPEG4 and MPEG 7 - depending on the compression method and image quality.
	MPEG2	Moving Picture Experts Group Phase 2: A higher standard of MPEG which is applied to video (movie) requiring higher quality.
	MPEG Audio Layer II	One of three audio compression standards (layers I-III) defined by MPEG.
P	PC card	Standard card type expansion device that is inserted into a slot for PC card. JEITA and PCMCIA (Personal Computer Memory Card International Association) are cooperating to perform standardization. There are three types of cards - TYPE I, II and III - depending on differences in functions and thickness. The PC card is also referred to as a PCMCIA card.
R	Progressive scan CCD Sensor	This CCD image sensor scans an image once to create a one-image signal. Also referred to as a non-interlaced CCD sensor.
	Protocol	Procedure, regulations and conventions for data communications.
	RAID	Redundant Array of Independent Disks: This technique arrays multiple hard disks and then uses them as one disk to decentralize accesses, thereby enhancing reliability and process speed. There are seven types of RAID - RAID0-RAID6.
	RJ-45	8-pole, 8-core connector used for communication cable.
	RS-232C	Recommended Standard 232 version C: One of the serial communication standards established by EIA. Communication standard for one-to-one connections only. 25-pin or 9-pin D-SUB connectors are used.
	RS-485	Recommended Standard 485: One of serial communication standards established by EIA. This standard complies with multiple-to-multiple connections of up to 32 units. 25-pin D-SUB connectors are normally used.
S	SCSI	Small Computer System Interface: A standard for connecting computer and peripheral devices. The number, First, Ultra, Wide, etc., prefixed or suffixed to SCSI indicates the data transfer rate and connector specifications.
	ScTP	Screened Twisted Pair: One type of twisted pair cables. Only the inside of the outermost sheath in this twisted pair cable is shielded. Noise resistance characteristics are superior to UTP.
	SIF	Standard Image Format: This format delivers the resolution of 320 horizontal × 240 vertical pixels.
	STP	Shielded Twisted Pair: One type of twisted pair cables, with each pair shielded. Noise resistance characteristics are superior to UTP or ScTP.
	SXGA	Super eXtended Graphics Array: An expanded specification of XGA, with resolution of 1280 horizontal × 1024 vertical pixels.
T	Twisted Pair Cable	One type of communication cables: Two sheathed cables are twisted into one pair, which is further sheathed. 4 pairs of cables twisted and sheathed are normally used for communication cables.
U	UTP	Unshielded Twisted Pair: One type of twisted pair cables, without shield. Noise resistance characteristics are inferior to ScTP.
V	VBR	Variable Bit Rate: This format of coding audio and video varies the amount of data depending on the subject image.
	VGA	Video Graphics Array: The resolution is 640 horizontal × 480 vertical pixels.

Index	Abbreviation/ Term	Explanation
W	WDR	Wide Dynamic Range: The Hitachi wide dynamic range technique lets a video camera with progressive scan CCD record an image at a shutter speed suitable for brighter object and another image at a shutter speed suitable for darker object. It then synthesizes the two images, thereby reproducing a clear picture.
X	XGA	eXtended Graphics Array: Extended VGA specifications with the resolution of 1024 horizontal × 768 vertical pixels.
0-9	10Base-T	Ethernet specifications using twisted pair cables. The number indicates data transfer rate; T after a hyphen indicates the use of a twisted pair cable. The data transfer rate of 10Base-T is 10 Mbps, and the data transfer rate of 10Base-T/TX is 100 Mbps.
	100Base-T	
	100Base-TX	

3 Description of Operation

3-1 Structure Schematics

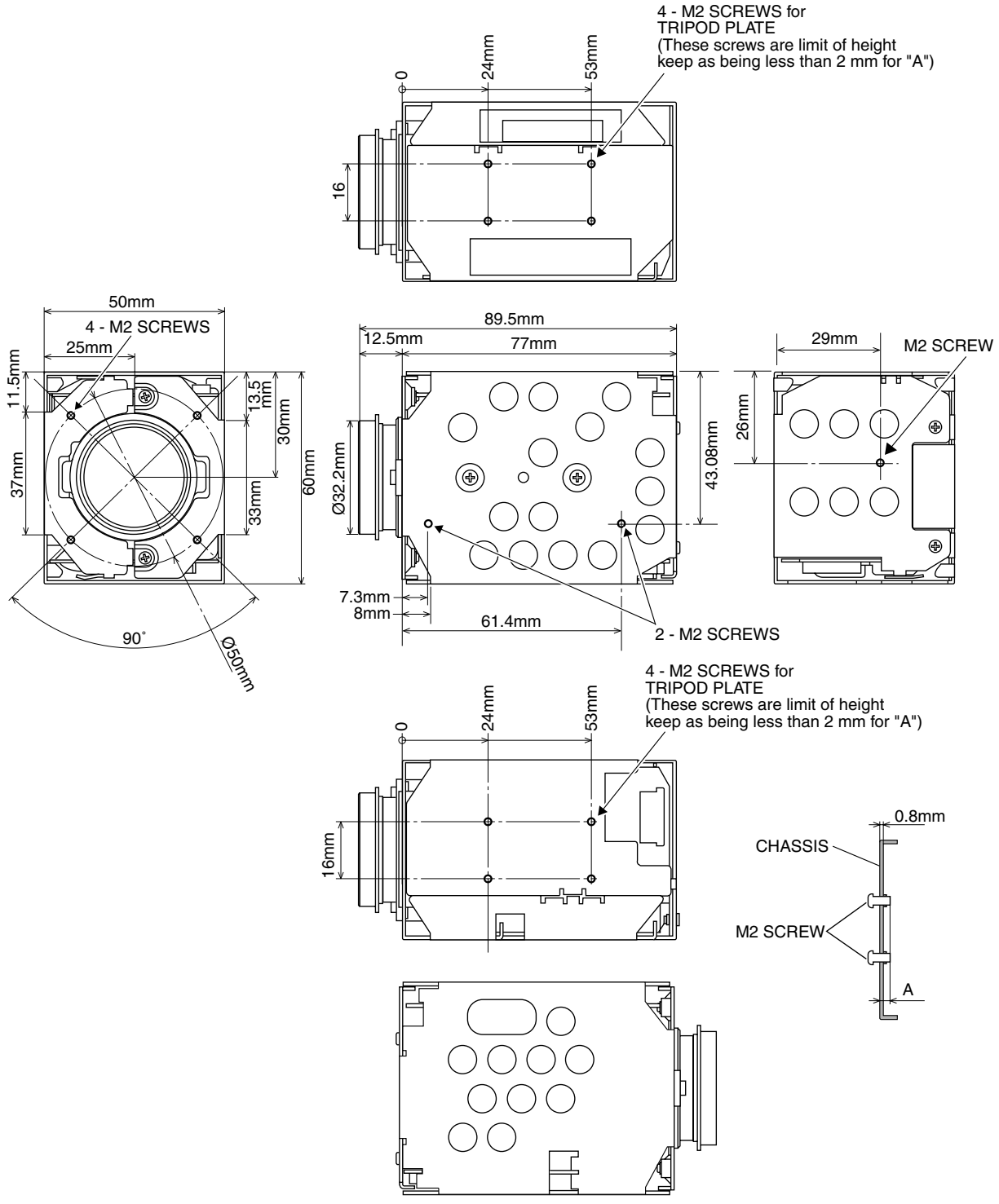


Fig. 3-1-1 Structure Schematics

3-2 Microprocessor Pin Function Table

3-2-1 Camera microprocessor (IC1201: Camera µP)

Pin No.	Abbreviation	I/O	Active Level	Function
1	LD-DSP	O	(Pulse)	Activates data communication with IC1121 (CAMERA DSP).
2	4800ST	-----	-----	Not used. Open.
3	-----	-----	-----	
4	GYRO-RST	O	Hi	
5	-----	-----	-----	
6	-----	-----	-----	
7	RDOEB	O	Lo	Activates focus drive data communications with IC1302 (FOCUS MOTOR DRIVE).
8	ZDOEB	O	Lo	Activates zoom drive data communications with IC1301 (ZOOM MOTOR DRIVE).
9	RDCK	O	(Pulse)	Outputs focus motor drive signal to IC1302 (FOCUS MOTOR DRIVE).
10	ZDCK	O	(Pulse)	Outputs zoom motor drive signal to IC1301 (ZOOM MOTOR DRIVE).
11	IRDCK	O	(Pulse)	Outputs IR motor drive signal to IC1380 (IR MOTOR DRIVE)
12	VCC(3V)	-----	-----	3V power input.
13	LINE-SW	I	Hi/Lo	External sync detection input. When "Hi" is input, the unit will be driven in the external sync mode; when "Lo" is input, it will be driven in the internal sync mode.
14	GND	-----	-----	Ground.
15	IRDCW	O	Hi/Lo	Issues a command which determines with IC1380 (IR MOTOR DRIVE)
16	IROREB	O	(Pulse)	Activates focus drive data communications with IC1380 (IR MOTOR DRIVE)
17	IR-RESET	O	Hi	Resets IC1380 (IR MOTOR DRIVE)
18	IR-SENS	I	(Pulse)	IR motor position detection input.
19	IR-LED	O	-----	Not used. Open.
20	-----	-----	-----	
21	-----	-----	-----	
22	-----	-----	-----	
23	TEST0	-----	-----	
24	TEST1	-----	-----	
25	CHECK8	-----	-----	
26	ZD-RESET	O	Hi	Resets IC1301 (ZOOM MOTOR DRIVE).
27	RD-RESET	O	Hi	Resets IC1302 (FOCUS MOTOR DRIVE).
28	IRIS-PWM	O	(Pulse)	Iris motor drive output .
29	LD-JIG	-----	-----	Not used. Open.
30	ZOOM-LED	O	(Pulse)	Output pulses to drive the ZOOM LED in the lens block via Q1201 (LED DRIVE).
31	TXD2	-----	-----	Not used. Connected to 3V line via resistor.
32	RXD2	-----	-----	
33	FCUS-LED	O	(Pulse)	Output pulses to drive the FOCUS LED in the lens block via Q1201 (LED DRIVE).
34	ZDCW	O	Hi/Lo	Issues a command which determines with IC1301 (ZOOM MOTOR DRIVE).
35	ZD-PWMA	-----	-----	Not used. Open.
36	RDCW	O	(Pulse)	Issues a command which determines with IC1302 (FOCUS MOTOR DRIVE).

Pin No.	Abbreviation	I/O	Active Level	Function
37	RD-PWMA	O	-----	Not used. Open.
38	FV	I	(Pulse)	Receives the vertical sync pulses that detect the iris detection area, from IC1121 (CAMERA DSP).
39	FCUS-SEN	I	(Pulse)	Focus motor position detection input.
40	-----	-----	-----	Not used. Open.
41	ZOM-SEN	I	(Pulse)	Zoom motor position detection input.
42	GND	-----	-----	Ground.
43	HAL-ADJ1	O	0V-3V	Controls the offset voltage of IC1351 (F.DET/IRIS DRIVE).
44	HAL-ADJ0	O	0V-3V	Drives bias generator in IC1351 (F.DET/IRIS DRIVE) via Q1351 (BIAS DRIVE) to control the bias voltage of the Hall devices.
45	BATTERY	I	0V-5V	Not used. Connected to 3V line and ground via resistors.
46	ZOOM-SW	I	0V-3V	Not used. Connected to 3V line and ground via resistors and capacitor.
47	FOCUS-SW	I	0V-3V	
48	+B-DET	I	0V-3V	Power voltage (+B) detection input. Monitors the +B line voltage.
49	TEMP-ADJ	I	0V-3V	Temperature change detection input. Detects variations in the forward voltage at the connected diode to correct the back-focus.
50	V-GYRO	I	0V-3V	Not used. Connect to ground.
51	H-GYRO	I	0V-3V	
52	FDET	I	0V-3V	F-value detection input. Receives the F.DET voltage detected by IC1351 (F.DET/IRIS DRIVE) and compares this with the reference voltage input via pin 53 to detect the F-value.
53	AVCC	-----	-----	Reference 3V power input.
54	AVCC	-----	-----	A/D reference voltage input (connected to 3V power supply).
55	VCC	-----	-----	3V power input.
56	VCC	-----	-----	
57	-----	-----	-----	Not used. Open.
58	-----	-----	-----	Not used. Connect to ground.
59	RESET-IN	I	Lo	Reset signal input from IC1251 (RESET PULSE GEN.).
60	VCC	-----	-----	3V power input.
61	STBY	-----	-----	Not used. Connect to 3V power supply.
62	VCC	-----	-----	3V power input.
63	-----	-----	-----	Not used. Open.
64	GND3	-----	-----	Grounded.
65	SYS-CLK	I	-----	Inputs control pulses from IC1211 (CAMERA DSP).
66	FWE	-----	-----	Not used. Connected to ground via resistors.
67	MD2	-----	-----	Not used. Connected to 3V line via resistors.
68	-----	-----	-----	Not used. Open.
69	HALL-G	O	Hi	Controls the amplification (gain of Hall device) of IC1351 (F.DET/IRIS DRIVE).
70	-----	-----	-----	Not used. Open.
71	-----	-----	-----	
72	HD	I	(Pulse)	Inputs horizontal sync from IC1121 (CAMERA DSP).
73	-----	-----	-----	Not used. Open.
74	-----	-----	-----	
75	FP	I	(Pulse)	Inputs field discrimination pulse from IC1121 (CAMERA DSP).
76	SD(232C)	O	(Pulse)	Used for initial settings and adjustment. For data communications with personal computer.
77	RD(232C)	I	(Pulse)	

Pin No.	Abbreviation	I/O	Active Level	Function
78	EP3	I	(Pulse)	Receives pulses which discriminate the iris detection area.
79	-----	-----	-----	Not used. Open.
80	-----	-----	-----	
81	-----	-----	-----	
82	-----	-----	-----	
83	SDO	O	(Pulse)	For data communications with IC1121 (CAMERA DSP), IC1202 (ADJ EEPROM), IC1250 (RESET EEPROM).
84	SDI	I	(Pulse)	
85	SCLK	O	(Pulse)	
86	-----	-----	-----	Not used. Open.
87	-----	-----	-----	
88	-----	-----	-----	
89	-----	-----	-----	
90	-----	-----	-----	
91	-----	-----	-----	
92	-----	-----	-----	
93	-----	-----	-----	
94	SYS-RST	-----	-----	
95	STBY_5V	O	Hi/Lo	5V regulator control output. (Hi: On/Lo:Off)
96	CK-CDS	O	(Pulse)	Transfer data to IC1101 (CDS/AGC & A/D CONV.).
97	SDO-CDS	O	(Pulse)	
98	CS-CDS	O	(Pulse)	Activates data communications with IC1101 (CDS/AGC & A/D CONV.).
99	CS-EE1	O	(Pulse)	Activates data communications with IC1202 (ADJ EEPROM).
100	CS-EE2	O	(Pulse)	Activates data communications with IC1203 (RESET EEPROM).

4 Troubleshooting

4-1 Trouble Diagnosis

4-1-1 Setting to service position

Remove chassis R and chassis L, referring to "5. Disassembly and Reassembly", and connect the camera as shown in Fig. 4-1-1.

Note:
To prevent short-circuit, always perform trouble diagnosis of camera on insulated mat.

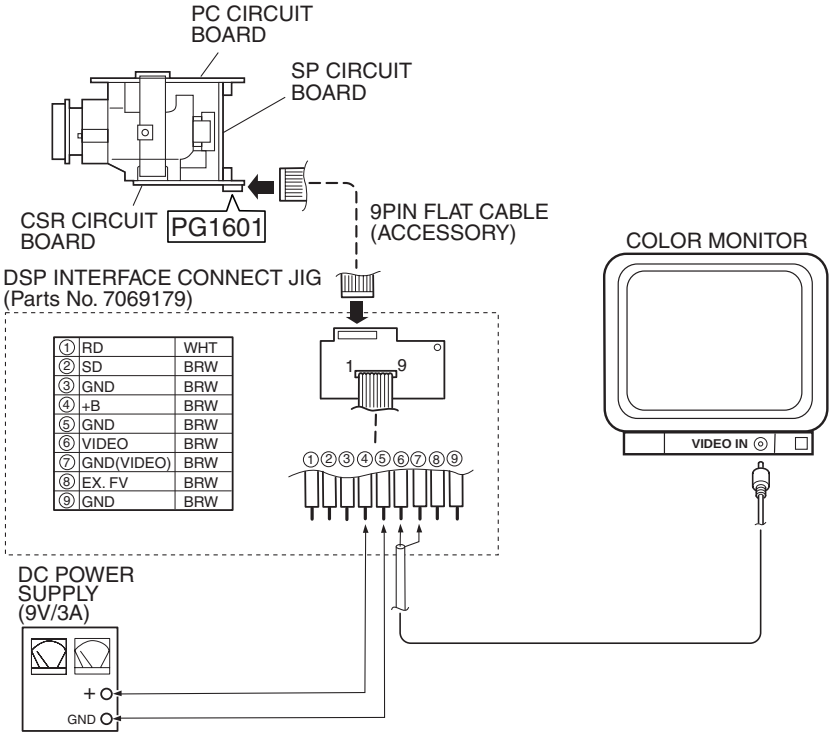
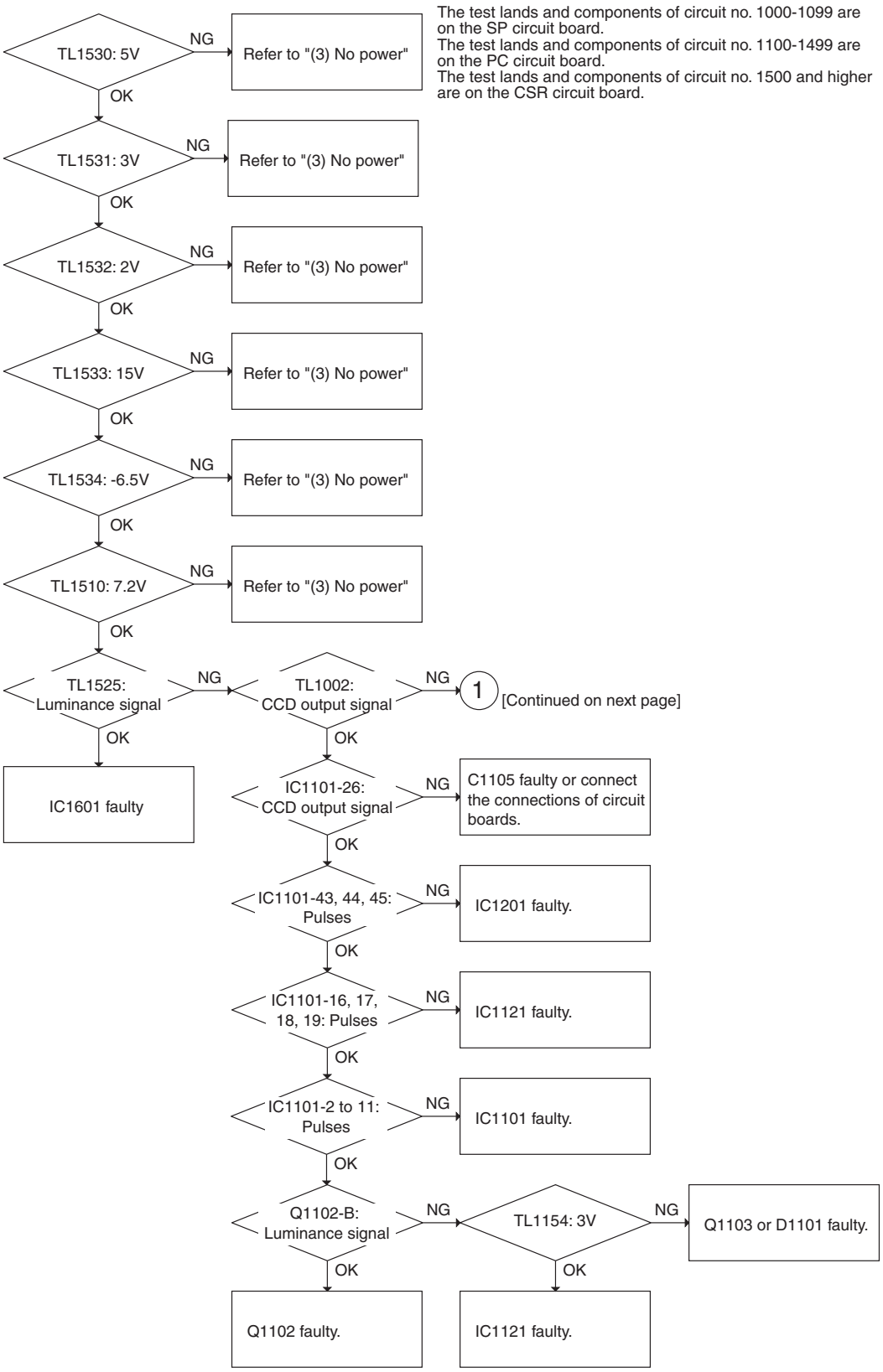
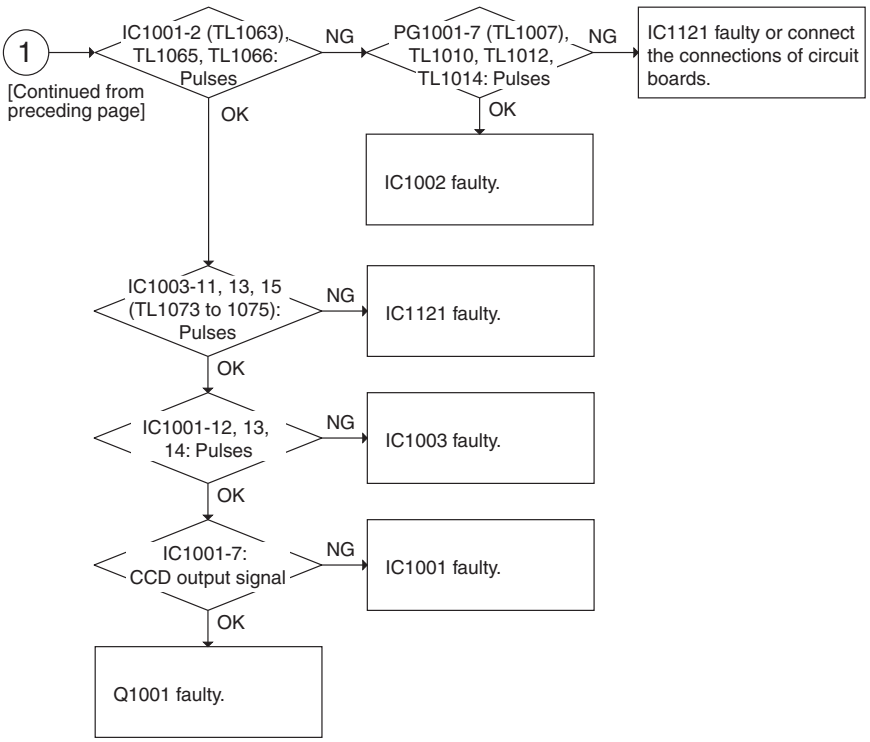


Fig. 4-1-1 Connections for Trouble Diagnosis

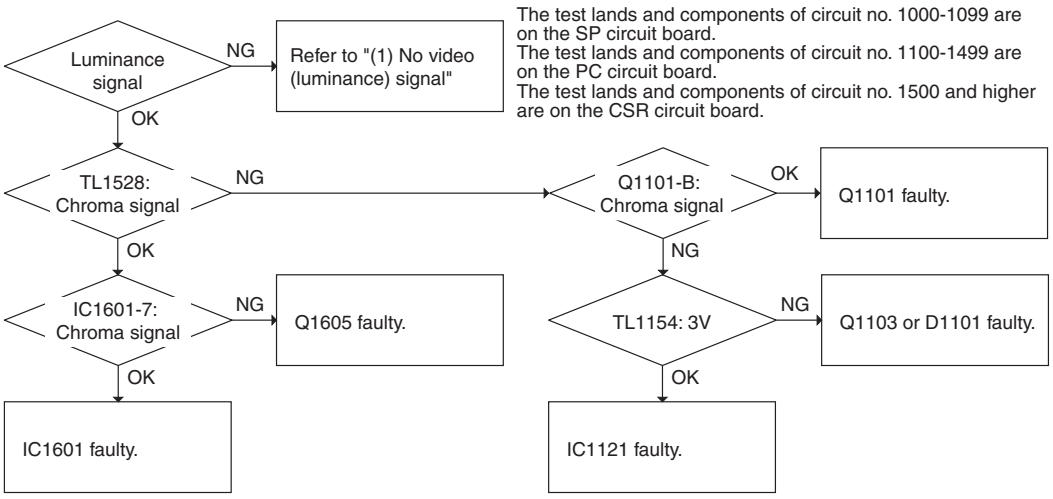
4-1-2 Trouble diagnosis flowchart

(1) No video (luminance) signal





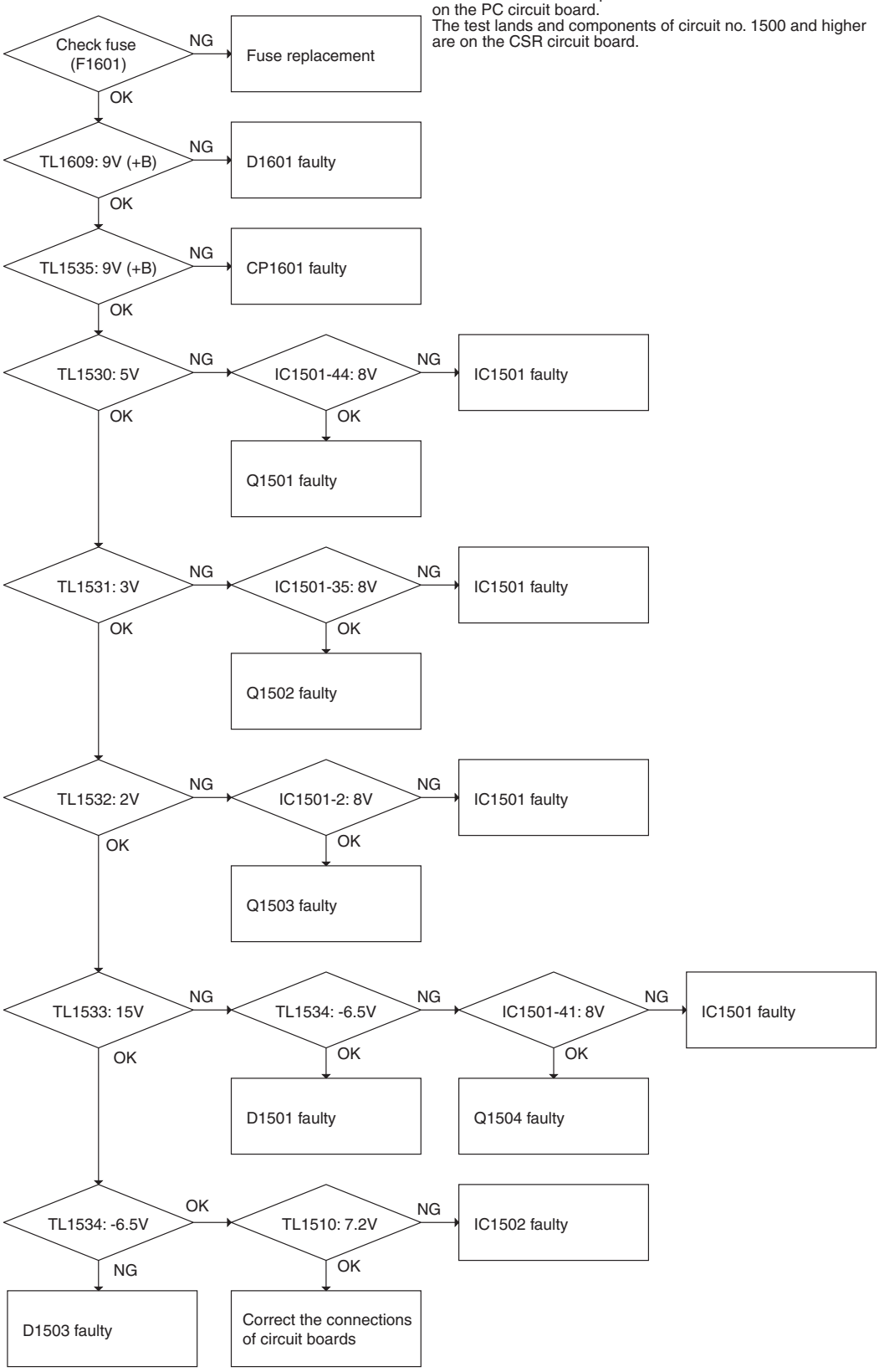
(2) No chroma signal



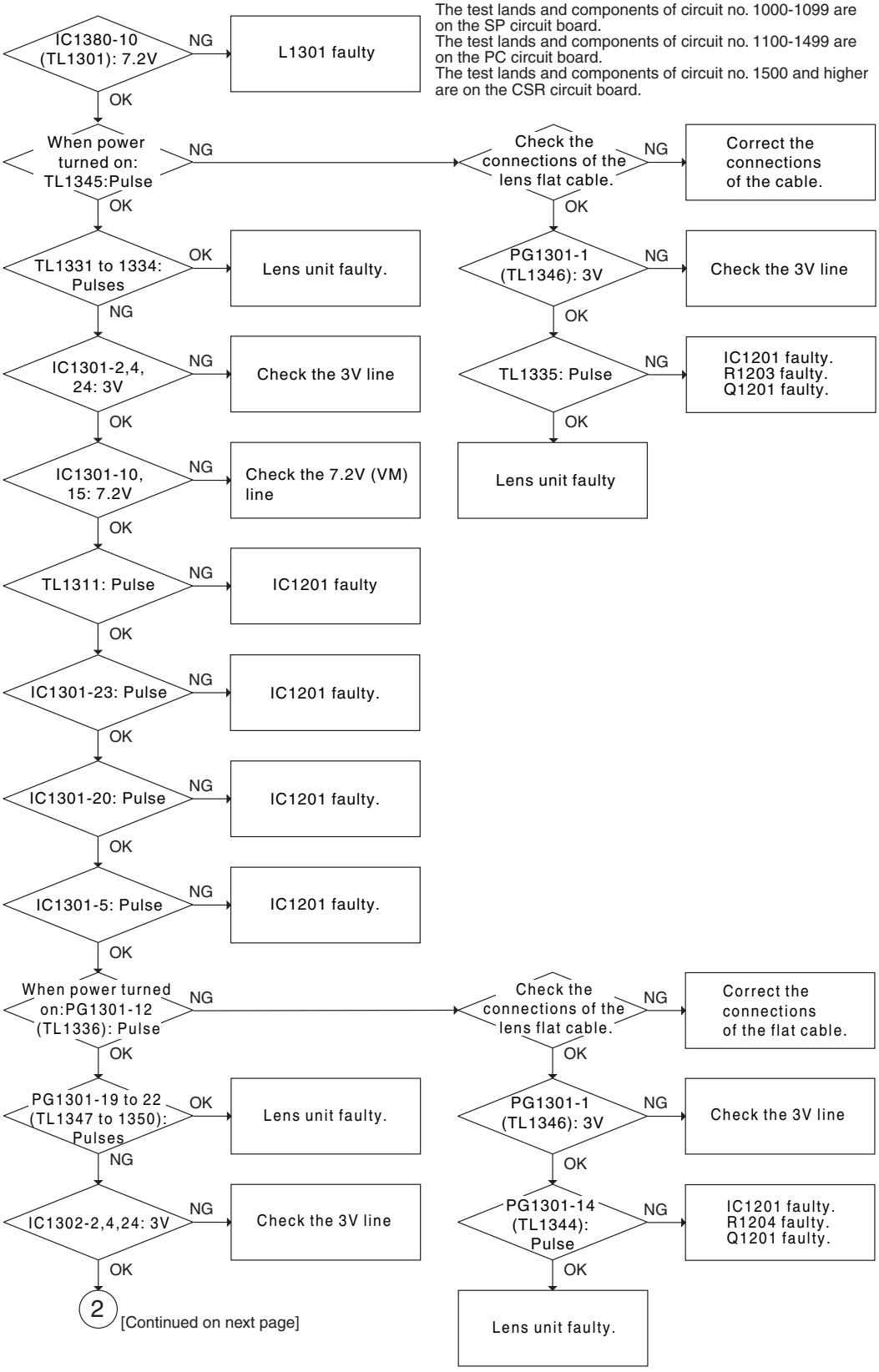
The test lands and components of circuit no. 1000-1099 are on the SP circuit board.
The test lands and components of circuit no. 1100-1499 are on the PC circuit board.
The test lands and components of circuit no. 1500 and higher are on the CSR circuit board.

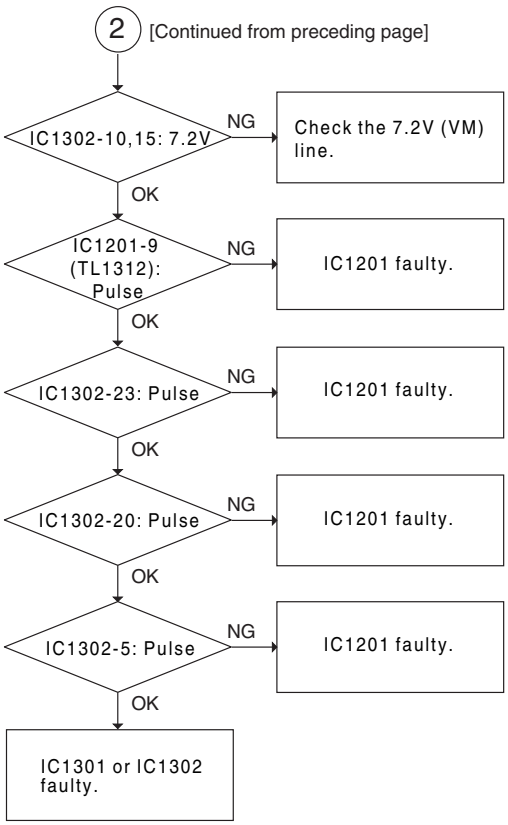
(3) No power

The test lands and components of circuit no. 1000-1099 are on the SP circuit board.
The test lands and components of circuit no. 1100-1499 are on the PC circuit board.
The test lands and components of circuit no. 1500 and higher are on the CSR circuit board.

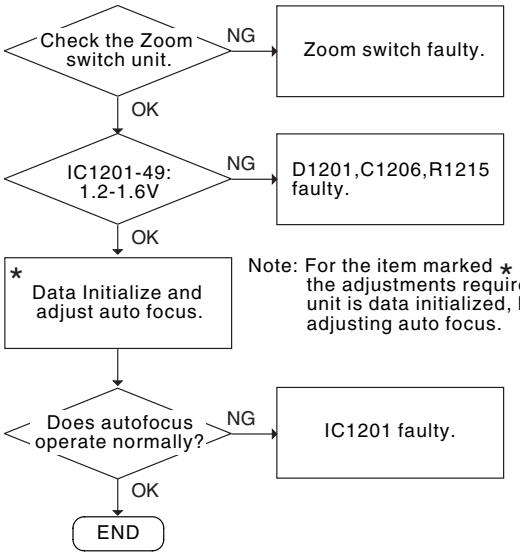


(4) No zoom and focus operation





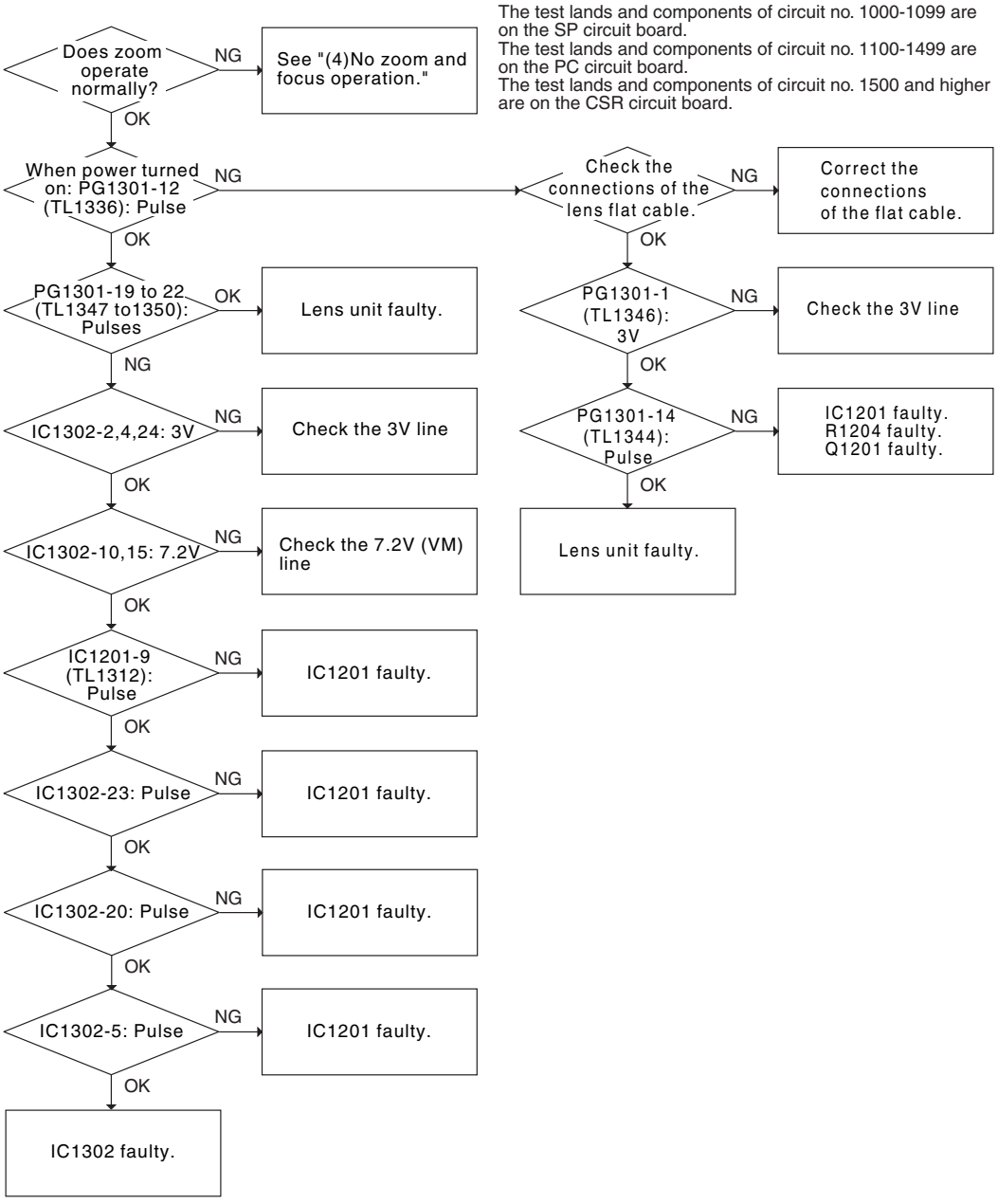
(5) Subject is greatly out-of-focus when zoomed



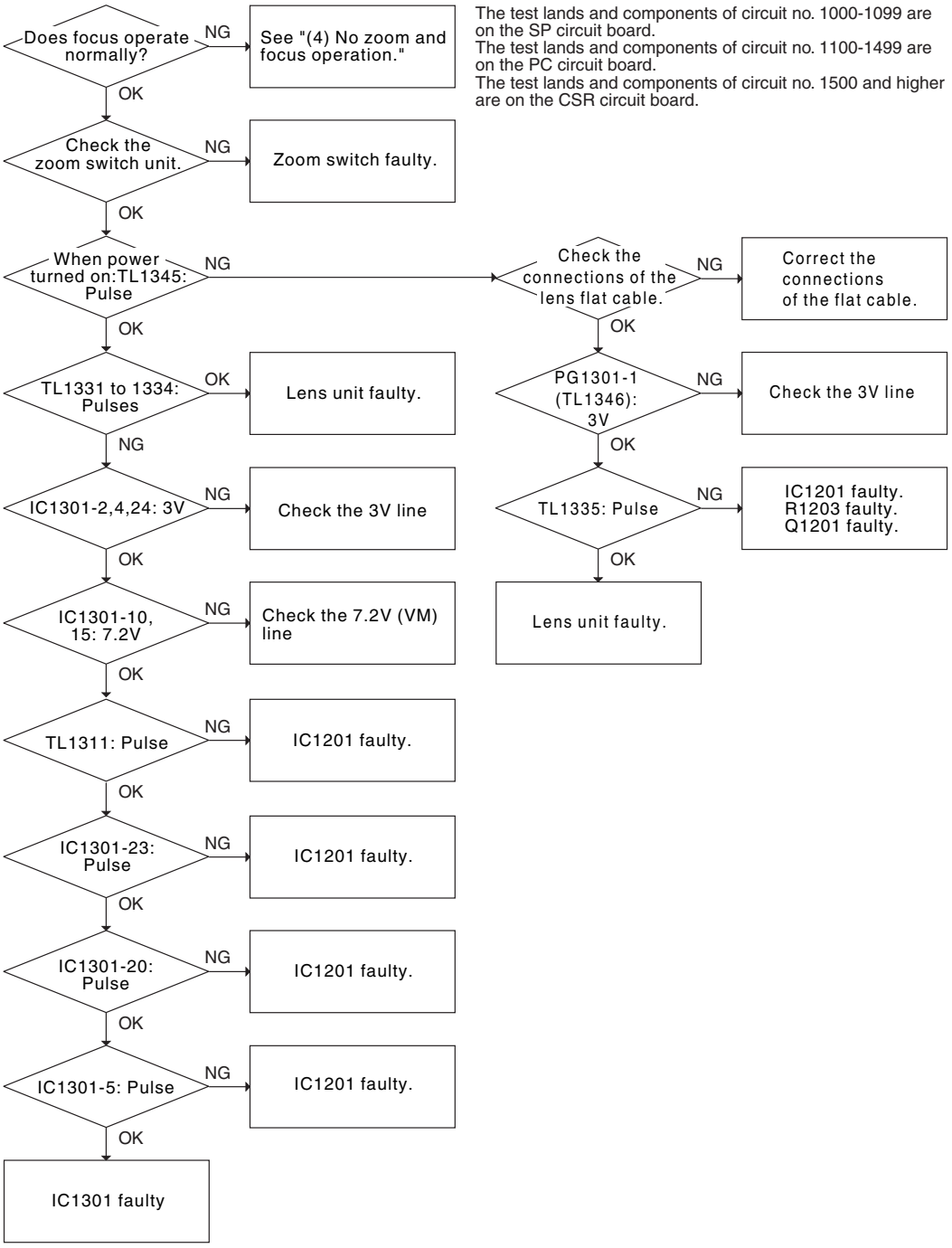
The test lands and components of circuit no. 1000-1099 are on the SP circuit board.
The test lands and components of circuit no. 1100-1499 are on the PC circuit board.
The test lands and components of circuit no. 1500 and higher are on the CSR circuit board.

Note: For the item marked * , perform all the adjustments required when the unit is data initialized, before adjusting auto focus.

(6) No focus lens operation

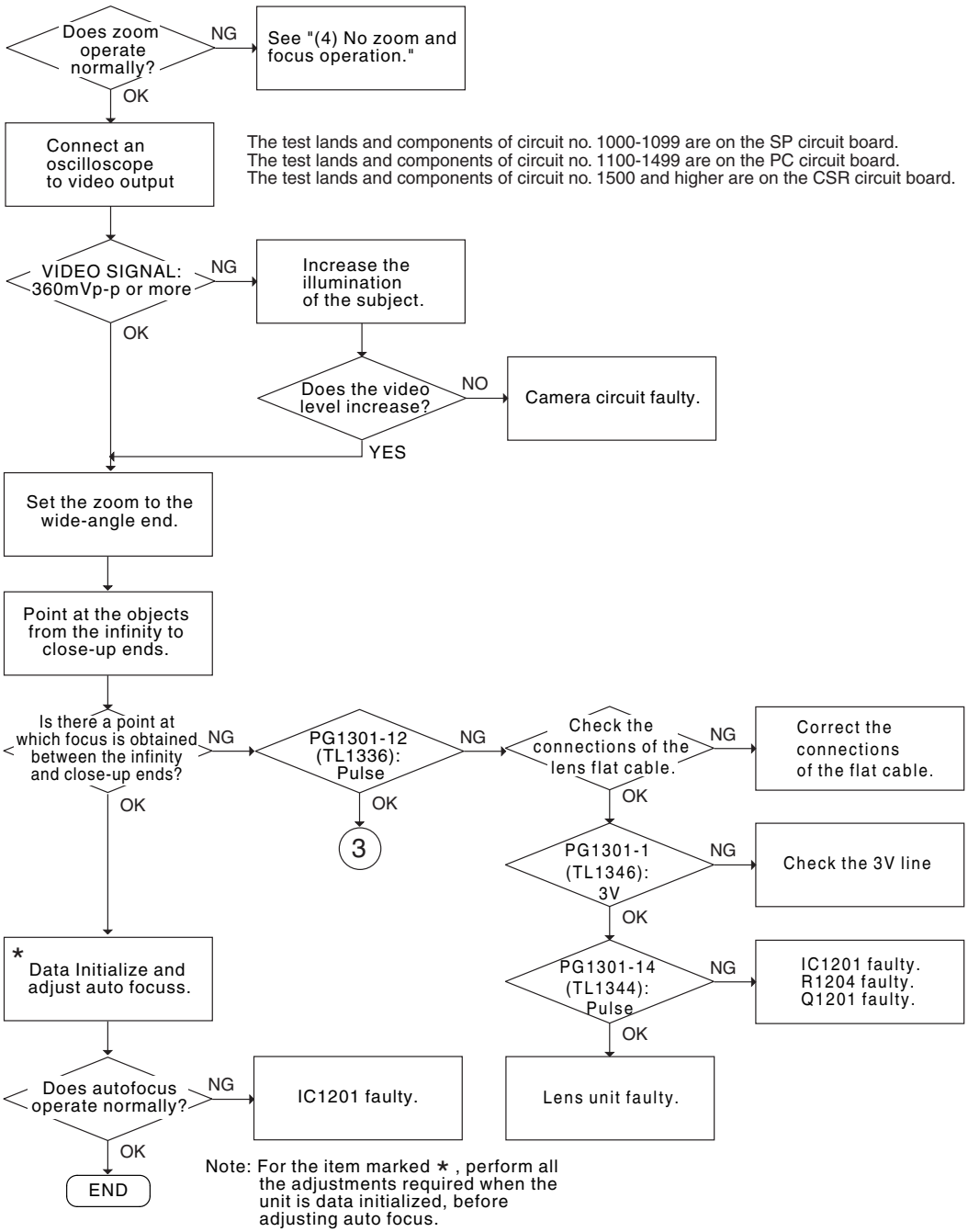


(7) No zoom operation

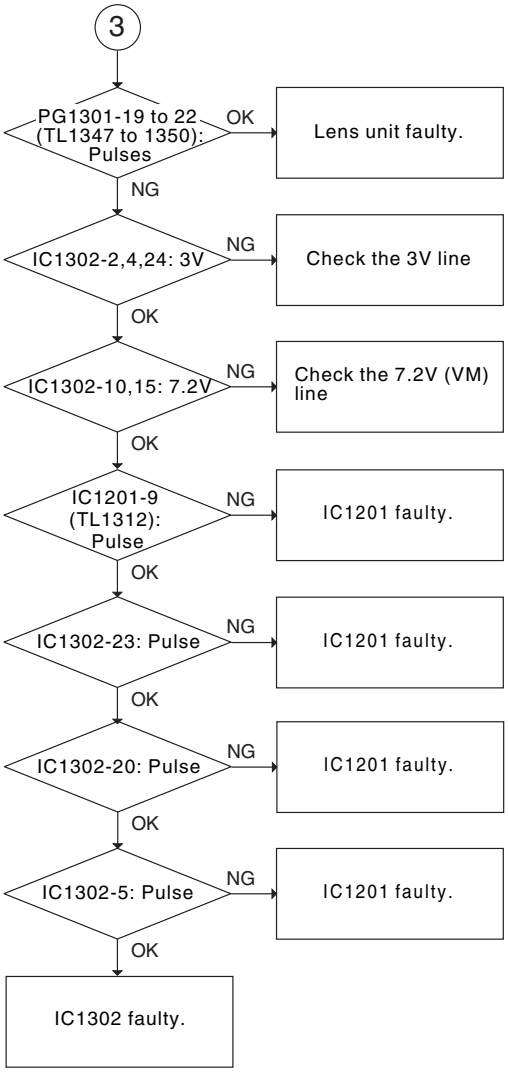


The test lands and components of circuit no. 1000-1099 are on the SP circuit board.
The test lands and components of circuit no. 1100-1499 are on the PC circuit board.
The test lands and components of circuit no. 1500 and higher are on the CSR circuit board.

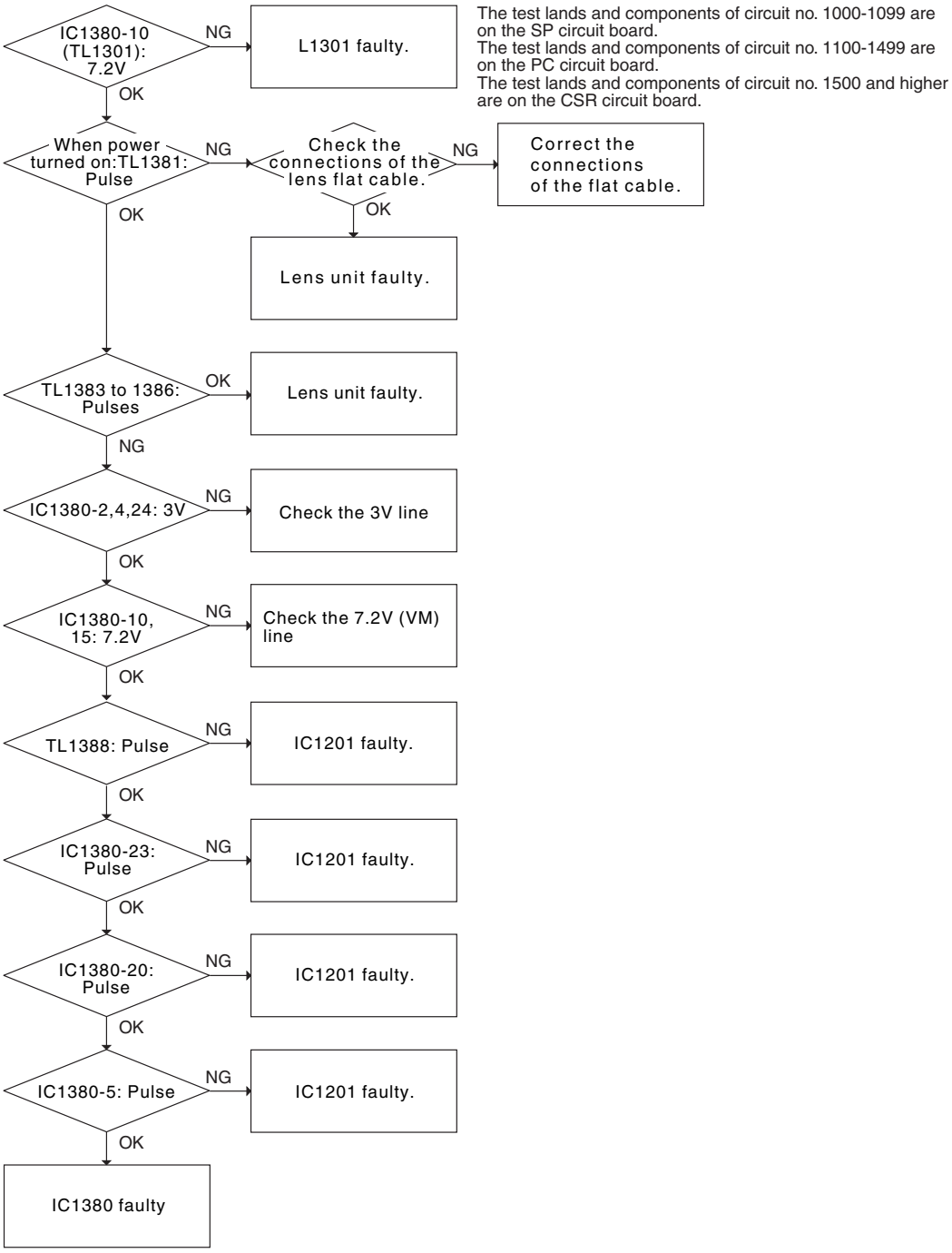
(8) No auto focus operation



Note: For the item marked * , perform all the adjustments required when the unit is data initialized, before adjusting auto focus.


3
PG1301-19 to 22 (TL1347 to 1350): Pulses
OK
Lens unit faulty.
NG
IC1302-2,4,24: 3V
NG
Check the 3V line
OK
IC1302-10,15: 7.2V
NG
Check the 7.2V (VM) line
OK
IC1201-9 (TL1312): Pulse
NG
IC1201 faulty.
OK
IC1302-23: Pulse
NG
IC1201 faulty.
OK
IC1302-20: Pulse
NG
IC1201 faulty.
OK
IC1302-5: Pulse
NG
IC1201 faulty.
OK
IC1302 faulty.

(9) No IR control operation



The test lands and components of circuit no. 1000-1099 are on the SP circuit board.
The test lands and components of circuit no. 1100-1499 are on the PC circuit board.
The test lands and components of circuit no. 1500 and higher are on the CSR circuit board.

5 Disassembly and Reassembly

5-1 Order of Disassembly

Refer to “Disassembly Flowchart” in Fig. 5-1-1 for the order of removing components. When reassembling components, use the reverse order to removal unless otherwise specified.

Note:
When replacing components in the VK-S454R/S454ER, be sure to use only those shown in "Replacement Parts List".

Reading Disassembly Flowchart:

After locating the target component in the flowchart, remove all components of the target in sequence, following the arrows (routes) from the top of flowchart.

Component name	Item No.
•Chassis R •Chassis L	1) and 2)
↓	
•PC Circuit Board	3) to 5)
↓	
•CSR Circuit Board	6) and 7)
↓	
•SP Circuit Board •Image Sensor	8) and 10)
↓	
•Lens unit	11)

Fig. 5-1-1

5-2 Disassembly

Information:
Numbers in figures are step numbers in disassemble procedure, and letters in brackets [ ] show the types of screw.

◆ Chassis L and R (Fig. 5-2-1)

1) Remove four screws [A] and remove the chassis L.
2) Remove two screws [A] and remove the chassis R.

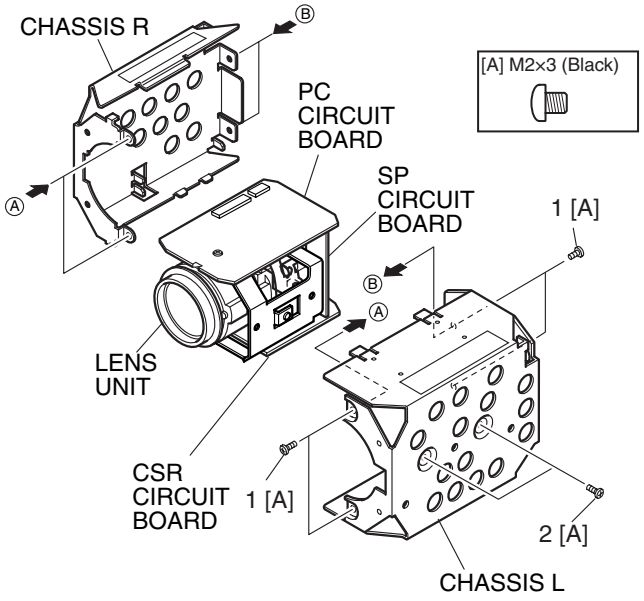


Fig. 5-2-1

◆ PC Circuit Board (Fig. 5-2-2)

3) Disconnect two flat cables from the PC circuit board.

4) Remove one screw [B].

5) Remove the PC circuit board in the direction of the arrow.

◆ CSR Circuit Board (Fig. 5-2-2)

6) Remove one screw [B].

7) Remove the CSR circuit board in the direction of the arrow.

◆ SP Circuit Board and Image Sensor (Fig. 5-2-2)

8) Remove two screws [C] and remove image sensor assembled with SP circuit board, the crystal filter and rubber also removed. Be careful not damage and lost them.

9) Unsolder the terminals (fourteen points) of image sensor on the SP circuit board.

10) Remove two screws [D] and remove image sensor form the SP circuit board.

◆ Lens Unit (Fig. 5-2-2)

11) Remove three screws [C] and remove the camera chassis for the lens unit.

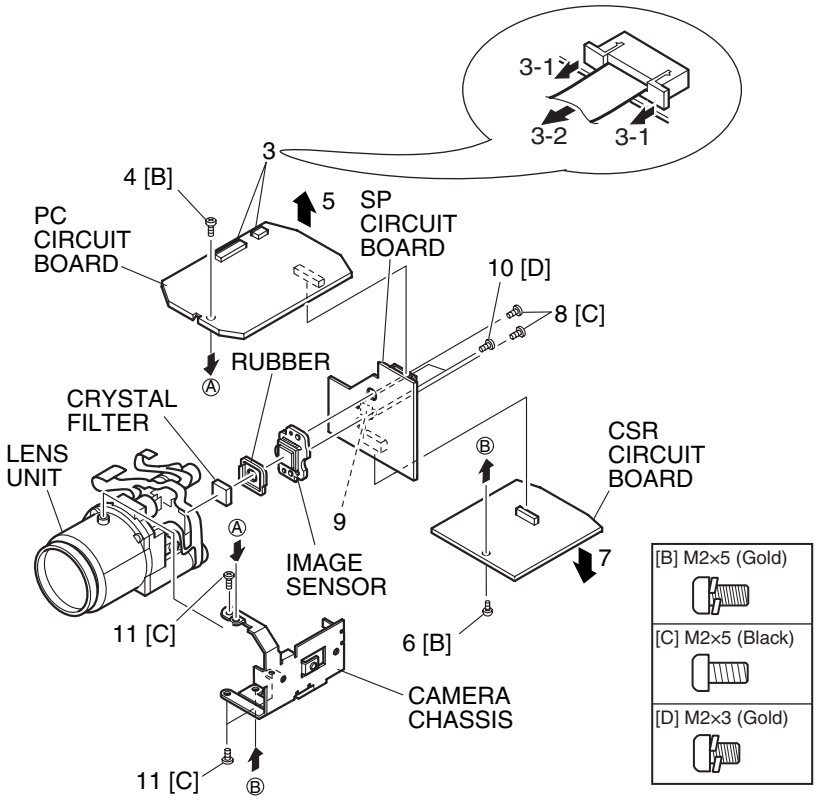


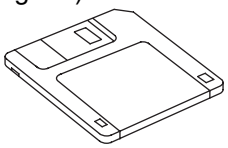
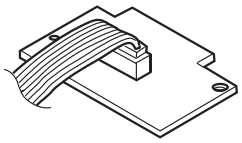
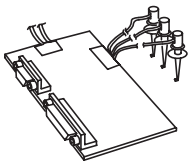
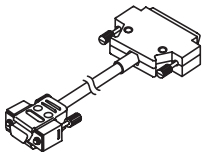
Fig. 5-2-2

6 Adjustment

6-1 Preparations for Adjustment

All adjustments are performed using the adjustment program (ZMAP: Zoom camera Manual Adjustment Program) and personal computer (PC). If error message appears during adjustment, refer to "6-9 Error Messages and Countermeasure".

6-1-1 List of equipment and jigs

New Adjustment Floppy Disk (Adjustment Program)*1 	DSP Interface Connect Jig No. 7069179 	DSP-R Jig No.7099448 	C12 Light Balancing Filter No.7099369
Personal Computer (PC) [Goods on the Market] 	RS-232C Cable (9 or 25 pins) Straight Type [Goods on the Market] 		

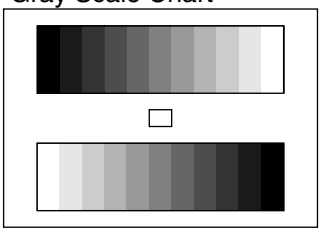
*1: The adjustment floppy disk is not for sale: It will be supplied only when service maintenance contract is concluded.

6-1-2 List of test equipment and charts

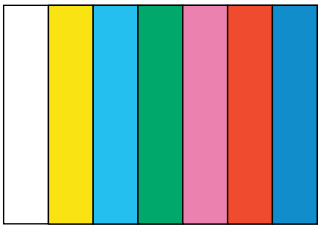
1) Gray scale chart
2) Color bar chart
3) Backfocus chart
4) Oscilloscope
5) Vectorscope
6) Digital voltmeter (DVM)
7) 3100K light box
8) Color Monitor
9) DC power supply for the video camera
10) DC power supply for the DSP-R jig

Information:
It is recommended that you use a vectorscope when performing the chroma gain adjustment. You can use an oscilloscope instead:
Note, however, that the adjustment accuracy will be lower.

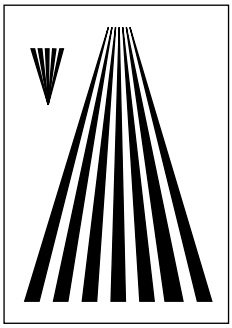
Gray Scale Chart



Color Bar Chart



Backfocus Chart



6-1-3 Connections for adjustment

Connect the video camera to the test equipment and jigs as shown in Fig. 6-1-1

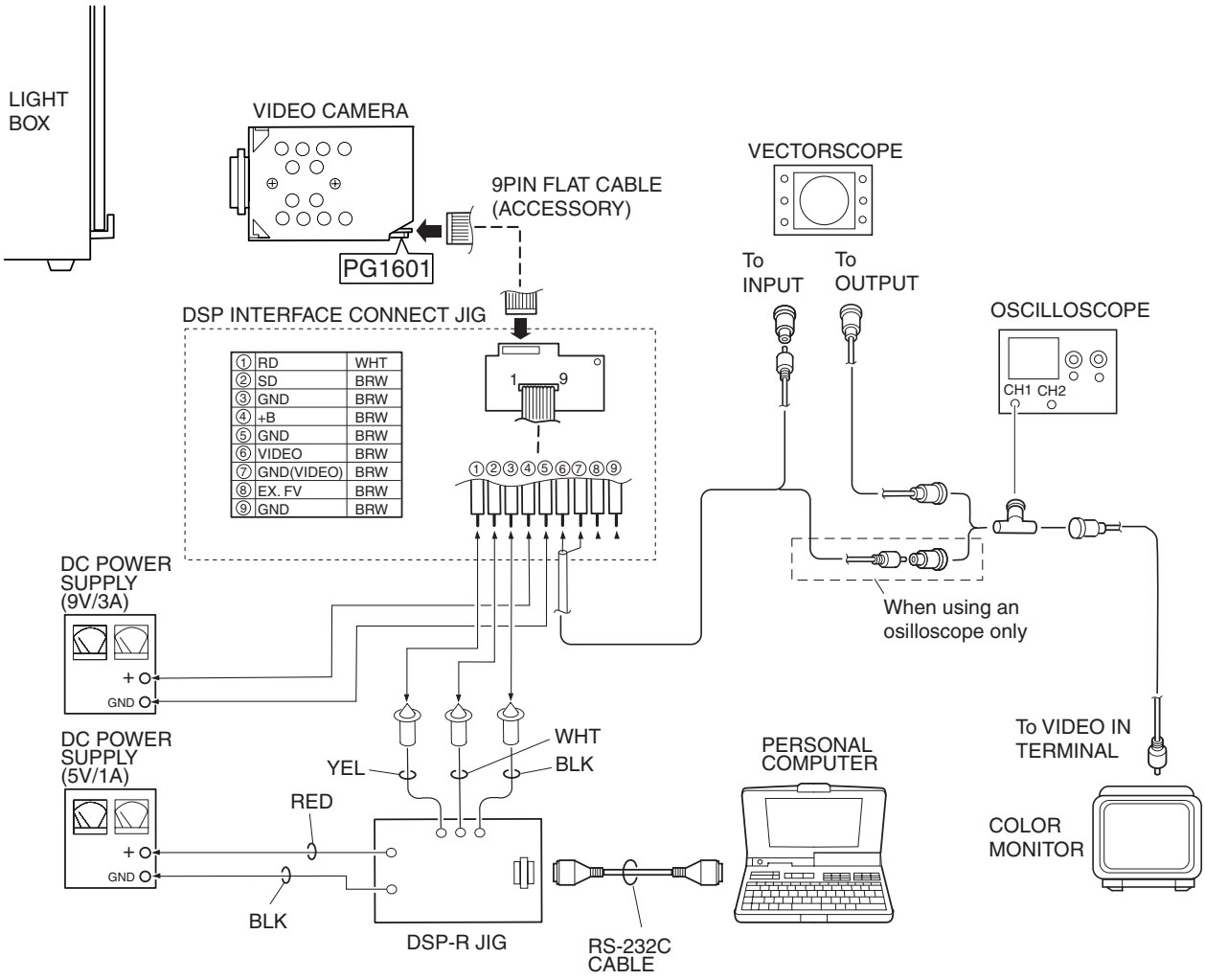


Fig. 6-1-1 Connections for Adjustment

Note:

1) The adjustment program will not operate normally unless the video camera, PC and DSP-R jigs are all turned on.
2) Take care with the following when pointing the video camera at a chart (light box):
   a) Focus the chart correctly.
   b) Set the chart (light box) 30-50 cm away from the lens surface, and avoid any effects from surrounding light (except for a case where some designation is given).
3) Be sure to connect the video output of video camera to a color video monitor (terminate the video output with 75 ohm):
   If the video output is not connected to the monitor (and if it is not terminated with 75 ohm), the output video signal level cannot be measured correctly.
4) Use light box that does not flicker and whose color temperature is controlled, for adjustment. If an inappropriate light box is used, precise adjustment will not be possible, and the adjustment program will not operate normally.

6-1-4 Setting test equipment

(1) Oscilloscope

The names of switches, knobs, modes, etc. of oscilloscope may vary slightly depending on the manufacturer or model. Since some oscilloscopes may have switches, etc. other than the above that must be set, see the instruction manual of the particular oscilloscope for details.

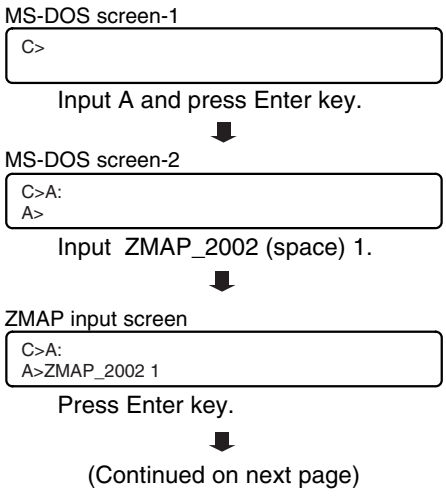
1) Probe: 10:1
2) TIME/DIV: 10 or 20 μs (except for a case where some designation is given)
3) VOLTS/DIV: Will vary depending on the measurement object (except for a case where some designation is given)
4) Synchronization: Internal sync (except for a case where some designation is given)
5) AC/DC/GND: AC (except for a case where some designation is given)

(2) Vectorscope

1) SATURATION: 75%

6-1-5 Starting adjustment program (ZMAP)

1) Connect the video camera, DSP-R jig and PC as shown in Fig. 2-1, and supply power to them. If the connection of jig, etc. is inappropriate or power is not supplied, the adjustment program will not start normally.
2) Operate the PC to start MS-DOS. For details on how to start MS-DOS, refer to the instruction manual of PC, since this varies for each PC.
3) Make sure that the adjustment floppy disk is write-protected.
4) Insert the adjustment floppy disk into the floppy disk drive of PC.
5) Use the PC keyboard to type **A:** and press **Enter** key. (See the MS-DOS screen-1 and 2)
   The letter to be input is to designate the drive into which the adjustment floppy disk has been inserted. If using a drive other than A, designate the drive.
6) Input **ZMAP_2002** (space) **1** and press **Enter** key. (See the ZMAP input screen)
   The number to be input after a space is to designate the serial port no. of PC. If the PC has two or more serial ports, and the DSP-R jig is connected to a port other than serial port 1, input the serial port number.



7) The ZMAP will start: Make sure that the model select screen appears on the PC display. (See the model select screen)
   If the model select screen does not appear, make sure of the following:
   a) Power is supplied to the video camera and DSP-R jig.
   b) The designation of drive (in step 5) is correct.
   c) The designation of serial port is correct.
   d) The correct adjustment floppy disk has been correctly inserted.
8) If the appropriate model is displayed on the model select screen, input the number to PC. If the appropriate model name is not shown on the model select screen, input P to PC until the model name appears. If an erroneous model name or number is selected, misoperation message will appear on PC display: Press any key to restore the model select screen.
9) The screen for verifying the model name will appear on PC display: If it is correct, input **Y** to PC. If it is incorrect, input N and start over (from step 8).
10) Make sure that the main menu appears on PC display: If it does not appear, check whether model selection (in step 8) is correct.

(Continued from preceding page)

Model select screen

```
**********************************************************
                    MODEL SELECT
**********************************************************

              [1]    xxxxxxxx
              [2]    xxxxxxxx
              [3]    xxxxxxxx
              [4]    xxxxxxxx
              [5]    xxxxxxxx
              [P]    NEXT SELECTION
              [ESC]  END

          Please select the type of the set
          Press [1] - [5] or [P] or [ESC]
```

Model select (Input the number).

Screen for verifying model name

```
          Selected model is xxxxxxxx
          Are you sure ?  (Y/N)
```

Input Y.

Main menu

```
**********************************************************
              MANUAL ADJUSTMENT PROGRAM
**********************************************************
              [A]    DATA INITIALIZE
              [B]    ELECTRIC VOLUME
              [C]    ADJUSTMENT
              [D]    AUTO FOCUS
              [E]    SPOT NOISE
              [F]    IR CONTROL
              [ESC]  END

          Please select [A] - [F] or [ESC]
```

Information

Misoperation message

```
          CAN NOT FIND THE DATA FILE
          **** PRESS ANY KEY ****
```

To terminate the adjustment program (ZMAP):

Press the **Esc** key once to three times until the PC display returns from each menu screen to the MS-DOS screen. When the MS-DOS screen appears on PC display, turn off the video camera and jig.

6-2 List of Adjustment Items

6-2-1 List of adjustments needed after replacing major

The following table shows the adjustment items, their purposes, and whether or not check is required after replacing major components.
The components shown in the table below are the minimum to be checked after replacing major components: If several components have been replaced - or depending on the cause of a defect more components may need to be checked.

Table 6-2-1 List of adjustments needed after replacing major

●: CHECK

Items	Purpose Adjustment	Electrical Parts					Circuit Board	Other
		IC1001	IC1101	IC1201	IC1202 IC1250 (*1)	IC1351	PC (*1)	Lens Block
Data Initialize								
Data Initilize (*2)	Initilizing EEPROM.				●		●	
Electric Volume								
CDS Sampling Pulse	To suppress noise in the CCD sensor output signal and maximize the signal level.		●		●		●	
Camera Adjustment (Adjustment)								
Auto Iris	To set the iris control data.	●		●	●	●	●	●
White Balance	To input the automatic white balance control data.	●			●		●	
Chroma Gain	To set the color satuation under the reference color temperrature.	●			●		●	
Auto Focus								
Zoom/Focus Tracking	To set the out-of -focus correction level during zooming.	●			●		●	●
AF Noise Level	To set the noise level in the autofocus circuit.	●			●		●	●
Check of Zoom/Focus Trace	To check the autofocus adjustment.	●			●		●	●
Spot Noise								
Spot Noise	To correct spot noise.	●			●		●	
IR Control								
IR Control	To set the IR filter control data.				●		●	●

*1: When replacing the PC circuit board or EEPROM, be sure to perform all adjustments only after "Data Initialize".

*2: Since all adjustments must be performed any time "Data Initialize" is done, do not perform it indiscriminately.

6-2-2 Adjustment flowchart

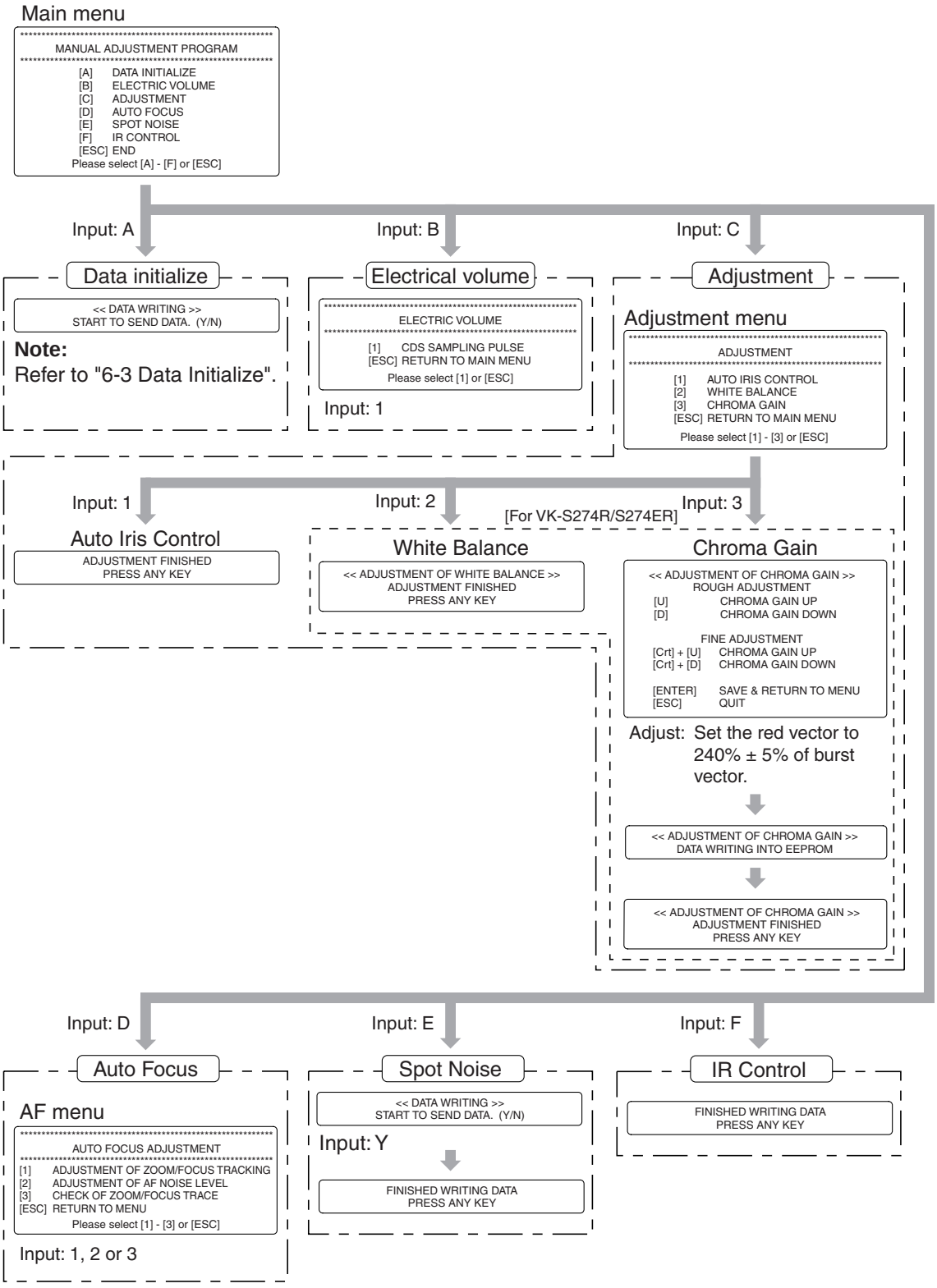


Fig. 6-2-1 Adjustment Flowchart

6-3 Data Initialize

Restriction:

1) This procedure initializes the adjustment data in EEPROM (including the adjustment data). Any time you replace the EEPROM, be sure to perform this procedure. Generally, this procedure is not necessary after replacing other components.
2) After completing this adjustment, be sure to perform all adjustment items as follows.

◆ Procedure

1) Input **A** to PC on the main menu screen.
2) The screen for verifying the initialization will appear: Input **Y** to PC. Entering N on the screen for verifying initialization will restore the data main menu screen.
3) Follow the instructions on PC display thereafter.

Main menu

```
**********************************************************
          MANUAL ADJUSTMENT PROGRAM
**********************************************************
          [A]    DATA INITIALIZE
          [B]    ELECTRIC VOLUME
          [C]    ADJUSTMENT
          [D]    AUTO FOCUS
          [E]    SPOT NOISE
          [F]    IR CONTROL
          [ESC]  END

          Please select [A] - [F] or [ESC]
```

Input A.

Screen for verifying initialization

```
          << DATA WRITING >>
      START TO SEND DATA.  (Y/N)
```

Input Y.
Follow the instructions on PC display thereafter.

6-4 Electronic Volume

Input **B** to PC on the main menu screen to display the electronic volume menu screen. Pressing the Esc key on the adjustment menu screen will restore the main menu screen.

Main menu

```
**********************************************************
          MANUAL ADJUSTMENT PROGRAM
**********************************************************
          [A]    DATA INITIALIZE
          [B]    ELECTRIC VOLUME
          [C]    ADJUSTMENT
          [D]    AUTO FOCUS
          [E]    SPOT NOISE
          [F]    IR CONTROL
          [ESC]  END

          Please select [A] - [F] or [ESC]
```

Input B.

Electronic volume menu

```
**********************************************************
                ELECTRIC VOLUME
**********************************************************
          [1]    CDS SAMPLING PULSE
          [ESC]  RETURN TO MAIN MENU

          Please select [1] or [ESC]
```

6-4-1 CDS sampling pulse adjustment

◆ Incompleted Phenomenon

Diagonal beats and horizontal noise occur.

◆ Condition:

Leave the video camera for more than 2 minutes until the circuits are stabilized after turning it on, then start adjustment.

◆ Procedure

1) Input **1** to PC on the adjustment menu screen.
2) Follow the instruction on PC display thereafter.

Electronic volume menu

```
**********************************************************
                    ELECTRIC VOLUME
**********************************************************
          [1]     CDS SAMPLING PULSE
          [ESC]   RETURN TO MAIN MENU
                Please select [1] or [ESC]
```

Input 1.
Follow the instructions on PC display thereafter.

6-5 Adjustment (Camera Adjustment)

Input **C** to PC on the main menu screen to display the adjustment menu screen and input to PC the appropriate adjustment number. Pressing the Esc key on the adjustment menu screen will restore the main menu screen.

Main menu

```
**********************************************************
                MANUAL ADJUSTMENT PROGRAM
**********************************************************
          [A]     DATA INITIALIZE
          [B]     ELECTRIC VOLUME
          [C]     ADJUSTMENT
          [D]     AUTO FOCUS
          [E]     SPOT NOISE
          [F]     IR CONTROL
          [ESC]   END
                Please select [A] - [F] or [ESC]
```

Input C.

⬇

Adjustment menu

```
**********************************************************
                    ADJUSTMENT
**********************************************************
          [1]     AUTO IRIS CONTROL
          [2]     WHITE BALANCE
          [3]     CHROMA GAIN
          [ESC]   RETURN TO MAIN MENU
                Please select [1] - [3] or [ESC]
```

6-5-1 Auto iris control adjustment

◆ Incompleted Phenomenon

1) The picture becomes too bright.
2) The picture becomes too dark.

◆ Condition

Set point at the light box, without chart inserted, to fill the screen.

◆ Procedure

1) Input **1** to PC on the adjustment menu screen.
2) Follow the instruction on PC display thereafter.
3) After the AIC (auto iris control) adjustment complete screen appears, press any key to restore the adjustment menu screen.
4) Turn the video camera off, leave as is for at least 5 seconds, and then turn it on again. When the video camera is turned on again, the ZMAP may not operate normally, and the following adjustments may not be possible. If this happens, press the Esc key to restore the MS-DOS screen, and then restart the ZMAP.

Adjustment menu

```
**********************************************************
                      ADJUSTMENT
**********************************************************
          [1]    AUTO IRIS CONTROL
          [2]    WHITE BALANCE
          [3]    CHROMA GAIN
          [ESC]  RETURN TO MAIN MENU
          Please select [1] - [3] or [ESC]
```

Input 1.
Follow the instructions on PC display thereafter.

⬇

AIC adjustment complete

```
ADJUSTMENT FINISHED
PRESS ANY KEY
```

Press any key.
Turn the video camera off.

6-5-2 White balance adjustment

◆ Incompleted Phenomenon

1) Color of the subject is different from that of the picture.
2) A white subject is not seen as white.

◆ Equipment/Jig

C12 light balancing filter

◆ Conditions

1) Attach a C12 light balancing filter to lens.
2) Point at a gray scale chart.

◆ Procedure

1) Input **2** to PC on the adjustment menu screen.
2) Follow the instructions on PC display thereafter.
3) After the white balance adjustment complete screen appears, press any key to restore the adjustment menu screen.

Adjustment menu

```
**********************************************************
                      ADJUSTMENT
**********************************************************
          [1]    AUTO IRIS CONTROL
          [2]    WHITE BALANCE
          [3]    CHROMA GAIN
          [ESC]  RETURN TO MAIN MENU
          Please select [1] - [3] or [ESC]
```

Input 2.
Follow the instructions on PC display thereafter.

⬇

White balance adjustment complete

```
<< ADJUSTMENT OF WHITE BALANCE >>
ADJUSTMENT FINISHED
PRESS ANY KEY
```

Press any key.

⬇

Adjustment menu

6-5-3 Chroma gain adjustment (Figs. 6-5-1, 6-5-2, 6-5-3)

◆ Incompleted Phenomenon

1) Color of the picture is denser than that of the subject.
2) Color of the picture is lighter than that of the subject.

◆ Test Point

Video Out (PG1601-6)

◆ Equipment/Jig

1) Vectorscope or Oscilloscope (It is recommended that you use a vectorscope when performing this adjustment.You can use an oscilloscope instead: Note, however, that the adjustment accuracy will be lower.)
2) C12 light balancing filter

◆ Condition

1) Attach a C12 light balancing filter to lens.
2) Point at a color bar chart.

◆ Procedure

1) Input **3** to PC on the adjustment menu screen.
2) The chroma gain adjustment screen will appear.
3) When using a vectorscope (Figs. 6-5-1, 6-5-2):
   Press the **D** or **U** key to set the red vector to approx. 220% of burst vector. Then, while holding down the **Ctrl** key, press the **D** or **U** key to set the red vector to approx. 220% ± 5% of burst vector.
   When using an oscilloscope (Fig. 6-5-3):
   Press the **D** or **U** key to set the red level on waveform to approx. 620 mVp-p.
   Then, while holding down the **Ctrl** key, press the **D** or **U** key to set the red level on waveform to approx. 620 mV ± 20 mVp-p.
4) Press the **Enter** key: The PC display will switch from the chroma gain data write screen to chroma gain adjustment complete screen.
5) Press any key to restore the adjustment menu screen.

Adjustment menu

```
**********************************************************
                    ADJUSTMENT
**********************************************************

        [1]     AUTO IRIS CONTROL
        [2]     WHITE BALANCE
        [3]     CHROMA GAIN
        [ESC]   RETURN TO MAIN MENU

        Please select [1] - [3] or [ESC]
```

Input 3.

Chroma gain adjustment

```
<< ADJUSTMENT OF CHROMA GAIN >>
          ROUGH ADJUSTMENT
[U]             CHROMA GAIN UP
[D]             CHROMA GAIN DOWN

          FINE ADJUSTMENT
[Crt] + [U]     CHROMA GAIN UP
[Crt] + [D]     CHROMA GAIN DOWN

[ENTER]         SAVE & RETURN TO MENU
[ESC]           QUIT
```

Press the D or U, and Cont key to set the red vector to 220 % ± 5 % of burst vector, and press Enter key.

Chroma gain data write

```
<< ADJUSTMENT OF CHROMA GAIN >>
    DATA WRITING INTO EEPROM
```

Chroma gain adjustment complete

```
<< ADJUSTMENT OF CHROMA GAIN >>
      ADJUSTMENT FINISHED
        PRESS ANY KEY
```

Press any key.

Adjustment menu

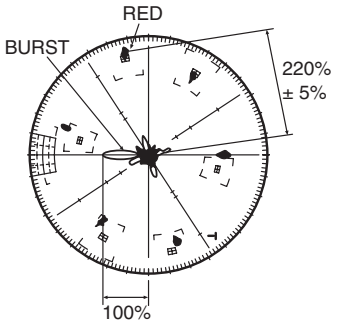


Fig. 6-5-1 For VK-S454R

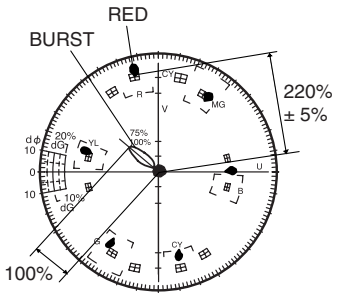


Fig. 6-5-2 For VK-S454ER

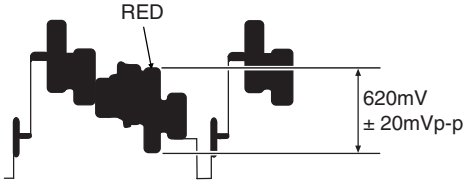


Fig. 6-5-3

6-6 Auto Focus

Input **D** to PC on the main menu screen to display the AF menu screen. Input the appropriate adjustment number to PC. Pressing the Esc key on the AF menu screen will restore the main menu screen.

Main menu

```
**********************************************************
          MANUAL ADJUSTMENT PROGRAM
**********************************************************
          [A]    DATA INITIALIZE
          [B]    ELECTRIC VOLUME
          [C]    ADJUSTMENT
          [D]    AUTO FOCUS
          [E]    SPOT NOISE
          [F]    IR CONTROL
          [ESC]  END
          Please select [A] - [F] or [ESC]
```

Input D.

AF menu

```
**********************************************************
          AUTO FOCUS ADJUSTMENT
**********************************************************
[1]    ADJUSTMENT OF ZOOM/FOCUS TRACKING
[2]    ADJUSTMENT OF AF NOISE LEVEL
[3]    CHECK OF ZOOM/FOCUS TRACE
[ESC]  RETURN TO MENU
          Please select [1] - [3] or [ESC]
```

6-6-1 Zoom/focus tracking adjustment

◆ Incompleted Phenomenon

Focus is lost during zooming.

◆ Condition

1) Point at the backfocus chart, 1500 ± 5mm away from the lens surface.
2) Light the backfocus chart with 200 - 400 lx.

Note:

1) Measure the distance between the chart and lens surface precisely.
2) Place the chart as parallel as possible to the lens surface.
3) The backfocus chart should always be at the center of the monitor screen when the zoom is set to the wide-angle and telephoto ends.
4) The zoom trace adjustment procedure is completed within 2 minutes after it is selected.
5) Do not place any obstruction between the lens and chart during adjustment.

◆ Procedure

1) Input **1** to PC on the AF menu screen.
2) Follow the instructions on PC display thereafter.

AF menu

```
**********************************************************
          AUTO FOCUS ADJUSTMENT
**********************************************************
[1]    ADJUSTMENT OF ZOOM/FOCUS TRACKING
[2]    ADJUSTMENT OF AF NOISE LEVEL
[3]    CHECK OF ZOOM/FOCUS TRACE
[ESC]  RETURN TO MENU
          Please select [1] - [3] or [ESC]
```

Input 1.
Follow the instructions on PC display thereafter.

6-6-2 AF noise level adjustment

◆ Incompleted Phenomenon

1) It takes time until a subject is brought into focus.
2) Correct focus is not obtained.

◆ Condition

Point at a light box without a chart inserted at a distance of up to 10cm.

Note:
1) Place the light box as parallel as possible to the lens surface.
2) The AF noise level adjustment procedure will be completed within thirty seconds after it is selected.

◆ Procedure

1) Input **2** to PC on the AF menu screen.
2) Follow the instructions on PC display thereafter.

AF menu

```
**********************************************************
          AUTO FOCUS ADJUSTMENT
**********************************************************
[1]    ADJUSTMENT OF ZOOM/FOCUS TRACKING
[2]    ADJUSTMENT OF AF NOISE LEVEL
[3]    CHECK OF ZOOM/FOCUS TRACE
[ESC]  RETURN TO MENU
          Please select [1] - [3] or [ESC]
```

Input 2.
Follow the instructions on PC display thereafter.

6-6-3 Check of zoom/focus trace

◆ Incompleted Phenomenon

Focus is lost during zooming.

◆ Condition

1) Point at the backfocus chart, 1500 ± 5mm away from the lens surface.
2) Light the backfocus chart with 200 - 400 lx.

Note:
1) Measure the distance between the chart and lens surface precisely.
2) Place the chart as parallel as possible to the lens surface.
3) The backfocus chart should always be at the center of the monitor screen when the zoom is set to the wide-angle and telephoto ends.
4) Do not place any obstruction between the lens and chart during adjustment.

◆ Procedure

1) Input **3** to PC on the AF menu screen.
2) Follow the instructions on PC display thereafter.
   If error message appears, readjust the following items:
   6-6-1 Zoom/focus tracking adjustment
   6-6-2 AF noise level adjustment

AF menu

```
**********************************************************
          AUTO FOCUS ADJUSTMENT
**********************************************************
[1]    ADJUSTMENT OF ZOOM/FOCUS TRACKING
[2]    ADJUSTMENT OF AF NOISE LEVEL
[3]    CHECK OF ZOOM/FOCUS TRACE
[ESC]  RETURN TO MENU
          Please select [1] - [3] or [ESC]
```

Input 3.
Follow the instructions on PC display thereafter.

6-7 Spot Noise

Spot noise refers to bright points that appear on the screen, which are caused by a defect in pixel of image sensor.

Note:
1) Perform this adjustment after specified components have been replaced (see "6-2-1 List of Adjustments Needed After Replacing Major ").
2) Perform this adjustment if spot noise occurs under abnormal usage conditions or after long-term use.
3) Perform this adjustment after completing all other adjustments. Perform this adjustment in normal video status.

◆ Incompleted Phenomenon

Spot noise occurs under abnormal usage conditions or after long-term use.

◆ Equipment/Jig

Color video monitor (CRT type is desirable)

◆ Condition

Cap the lens (so that no light enters).

◆ Procedure

1) Input **E** to PC on the main menu screen.
2) Follow the instructions on PC display thereafter.
3) The screen for verifying writing of spot noise data will appear: Input **Y**. Entering N on the screen for verifying writing of spot noise data will restore the main menu screen.
4) When writing data is complete, the spot noise data write complete screen will appear: Press any key to restore the main menu screen.

Note:
If spot noise still occurs after this adjustment is complete, the image sensor may be defective.

Main menu

```
**********************************************************
          MANUAL ADJUSTMENT PROGRAM
**********************************************************
          [A]   DATA INITIALIZE
          [B]   ELECTRIC VOLUME
          [C]   ADJUSTMENT
          [D]   AUTO FOCUS
          [E]   SPOT NOISE
          [F]   IR CONTROL
          [ESC] END
        Please select [A] - [F] or [ESC]
```

Input E.
Follow the instructions on PC display thereafter.

⬇

Screen for verifying writing of spot noise data

```
<< DATA WRITING >>
START TO SEND DATA.  (Y/N)
```

Input Y.

⬇

Spot noise data write complete

```
FINISHED WRITING DATA
PRESS ANY KEY
```

Press any key.

⬇

Adjustment menu

6-8 IR Control

◆ Condition

Cap the lens (so that no light enters).

◆ Procedure

1) Input **F** to PC on the main menu screen.
2) Follow the instructions on PC display thereafter.
3) The IR control data write complete screen will appear:
   Press any key to restore the main menu screen.

Main menu

```
**********************************************************
          MANUAL ADJUSTMENT PROGRAM
**********************************************************
          [A]   DATA INITIALIZE
          [B]   ELECTRIC VOLUME
          [C]   ADJUSTMENT
          [D]   AUTO FOCUS
          [E]   SPOT NOISE
          [F]   IR CONTROL
          [ESC] END

        Please select [A] - [F] or [ESC]
```

Input F.
Follow the instructions on PC display thereafter.

⬇

Spot noise data write complete

```
          FINISHED WRITING DATA
          PRESS ANY KEY
```

Press any key.

⬇

Adjustment menu

6-9 Error Messages and Countermeasure

A message may appear while you are adjusting the video camera. If a message appears, refer to the following table and take appropriate corrective action.

(1) When adjusting the electric volume and adjustment

Error Messages	Countermeasure
CAN'T ADJUST WHITE BALANCE PLEASE RETRY PRESS ANY KEY	1) The subject is too bright or too dark. 2) Check the light box. 3) Move the camera closer to or away from the light box. 4) Supply power again and readjust.
D RANGE OVER. ERROR ON da× ADJUSTMENT PRESS ANY KEY. (×: Error code)	1) Check the values in the hall amp circuit. 2) Defective soldering, damage to pattern, etc. in the above circuit.
D RANGE OVER ERROR ON HALL AMP IRIS CANNOT OPEN ANY MORE PRESS ANY KEY	1) Supply power again and readjust. 2) The subject is too dark. 3) Check the light box. 4) Move the camera closer to the light box. 5) Check the values in the hall amp circuit. 6) Defective soldering, damage to pattern, etc. in the above circuit.
ERROR OCCURRED. IRIS TROUBLE PRESS ANY KEY	1) Check whether or not power is supplied. 2) Check the values of the iris drive circuit. 3) Defective soldering, damage to pattern, etc. in the above circuit. 4) Check the iris block and replace it if necessary.
ERROR OCCURRED ON da× ADJUSTMENT PRESS ANY KEY	1) Check the values in the hall amp circuit. 2) Defective soldering, damage to pattern, etc. in the above circuit.
ERROR OCCURRED ON da0 and da1 ADJUSTMENT PRESS ANY KEY	1) Check the values in the hall amp circuit and its peripheral circuits. 2) Defective soldering, damage to pattern, etc. in the above circuits.
FILE NOT FOUND !!!! PRESS ANY KEY	1) The adjustment program (file) cannot be found. 2) Check the adjustment floppy disk and replace it if necessary.
FILE OPEN ERROR !!!! PRESS ANY KEY	1) The adjustment program (file) does not start. 2) Check the adjustment floppy disk and replace it if necessary.
ERROR OCCURRED ON C DUTY ADJUSTMENT PRESS ANY KEY	1) Check the values of the iris drive circuit. 2) Defective soldering, damage to pattern, etc. in the above circuit.
ERROR OCCURRED ON FDET ADJUSTMENT PRESS ANY KEY	1) Supply power again and readjust. 2) Check the values in the hall amp circuit. 3) Defective soldering, damage to pattern, etc. in the above circuit.
ERROR OCCURRED. ZOOM DOES NOT WORK PRESS ANY KEY	1) Supply power again and readjust.
STAURATION ERROR. TOO BRIGHT PRESS ANY KEY	1) The subject is too bright. 2) Move the camera further away from the light box.

Error Messages	Countermeasure
TOO BRIGHT PRESS ANY KEY	1) The subject is too bright. 2) Move the camera further away from the light box.
TOO DARK PRESS ANY KEY	1) The subject is too dark. 2) Check the light box. 3) Move the camera closer to the light box.

(2) When adjusting the auto focus

Error Messages	Countermeasure
AF ERROR	1) If this error message appears even when the adjustment is performed 2 or 3 times, the autofocus circuit system is defective. 2) Refer to "(4) No zoom and focus operation" on "4-1-2 Trouble Diagnosis Flowchart".
AF LIMIT OVER	1) Check the conditions of subject. 2) If this error message appears even when the adjustment is performed 2 or 3 times, the autofocus circuit system is defective. 3) Refer to "(6) No focus lens operation" on "4-1-2 Trouble Diagnosis Flowchart".
TIME OUT ERROR ON AF STEP	1) Check the conditions of subject. 2) If this error message appears even when the adjustment is performed 2 or 3 times, the autofocus circuit system is defective. 3) Refer to "(4) No zoom and focus operation" on "4-1-2 Trouble Diagnosis Flowchart".
TIME OUT ERROR ON FOCUS	
TIME OUT ERROR ON ZOOM	1) If this error message appears even when the adjustment is performed 2 or 3 times, the autofocus circuit system is defective. 2) Refer to "(7) No zoom operation" on "4-1-2 Trouble Diagnosis Flowchart".
TOO DARK	1) Insufficient lighting. Check the subject.
TRACE ERROR. ADJUST ZOOM TRACE & AF NOISE AGAIN	1) Supply power again and readjust.

(3) When adjusting the spot noise

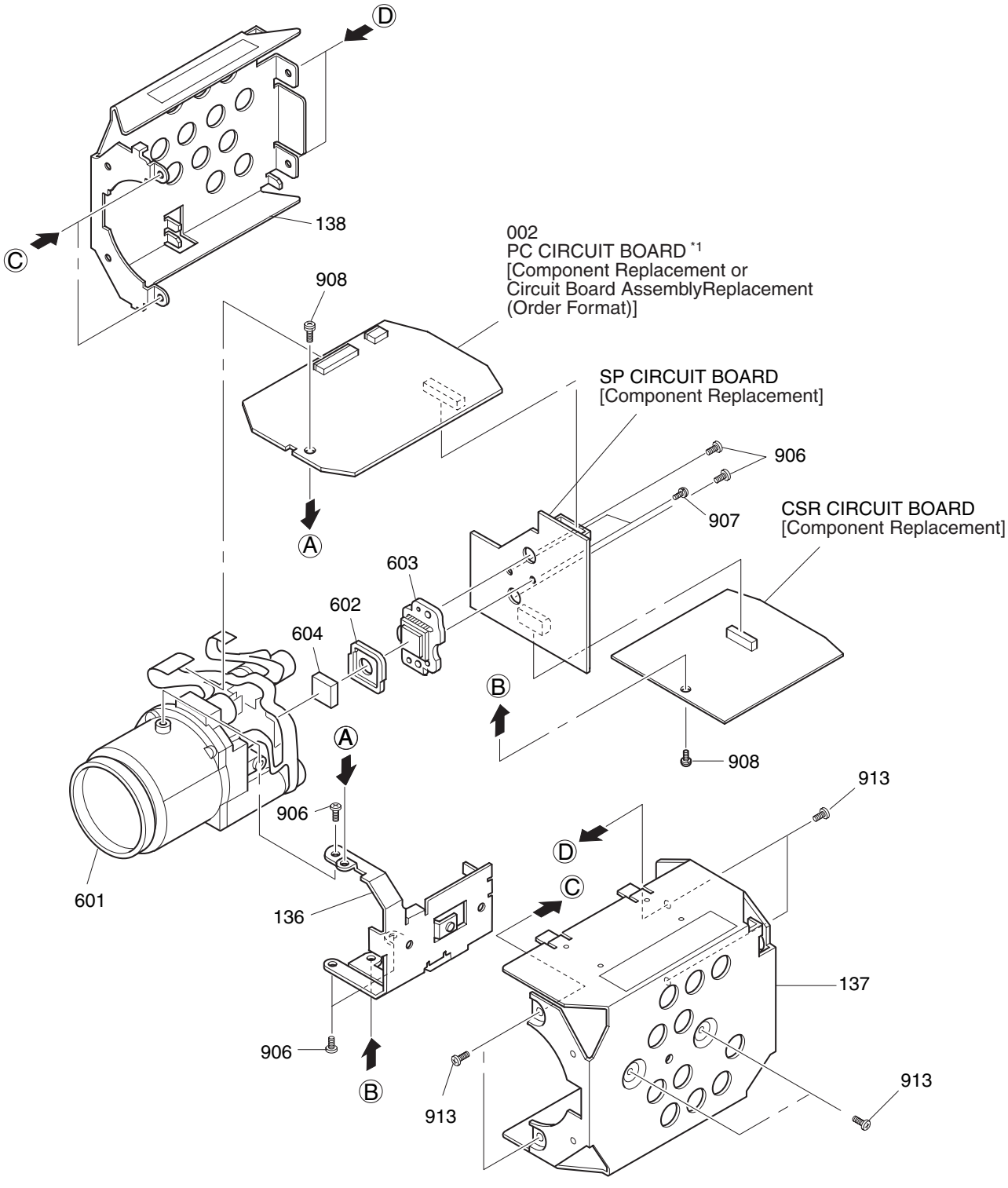
Error Messages	Countermeasure
ERROR!! SPOT NOISE COMPENSATION IS STOPPED BY INITIAL DATA. PLEASE CHECK THE EEPROM. PRESS ANY KEY.	1) Spot noise compensation is inhibited by the data in the EEPROM. 2) Turn the power on again. 3) Data in the EEPROM is defective. (data Initialize it.) 4) Check the EEPROM, and if necessary, replace it.
ERROR!! THE SPOT NOISE IS TOO MANY. CAN'T COMPENSATE ANY MORE. PRESS ANY KEY.	1) The amount of spot noise that can be compensated reaches the limit. 2) Turn the power on again. 3) Check the image sensor, and if necessary, replace it.
ERROR!! THRESHOLD DATA ERROR. PLEASE CHECK THE EEPROM. PRESS ANY KEY.	1) Turn the power on again. 2) Data in the EEPROM is defective. (data Initialize it.) 3) Check the EEPROM, and if necessary, replace it.

(4) When adjusting the IR Control

Error Messages	Countermeasure
IR ERROR	1) If this error message appears even when the adjustment is performed 2 or 3 times, the IR control circuit system is defective. 2) Refer to “(9) No IR control operation” on “4-1-2 Trouble Diagnosis Flowchart”.

7 Exploded View and Parts List

7-1 Exploded View



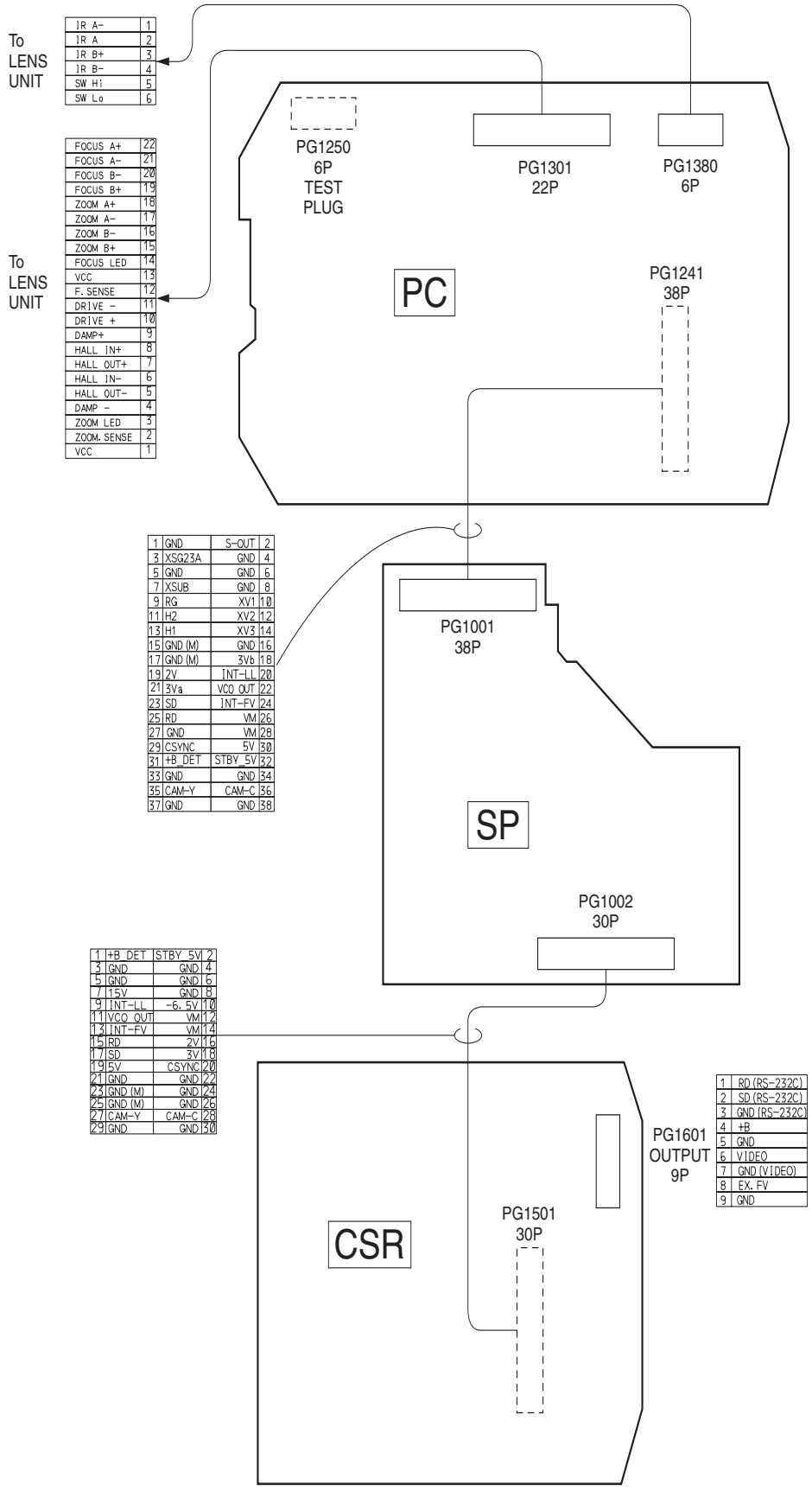
*1: Since IC1121 mounted on the PC circuit board is CSP type, replacement is not possible: Replace the whole PC circuit board when IC1121 becomes faulty. Other components on the PC circuit board can be replaced.

THE UPDATED PARTS LIST

FOR THIS MODEL IS

AVAILABLE ON ESTA

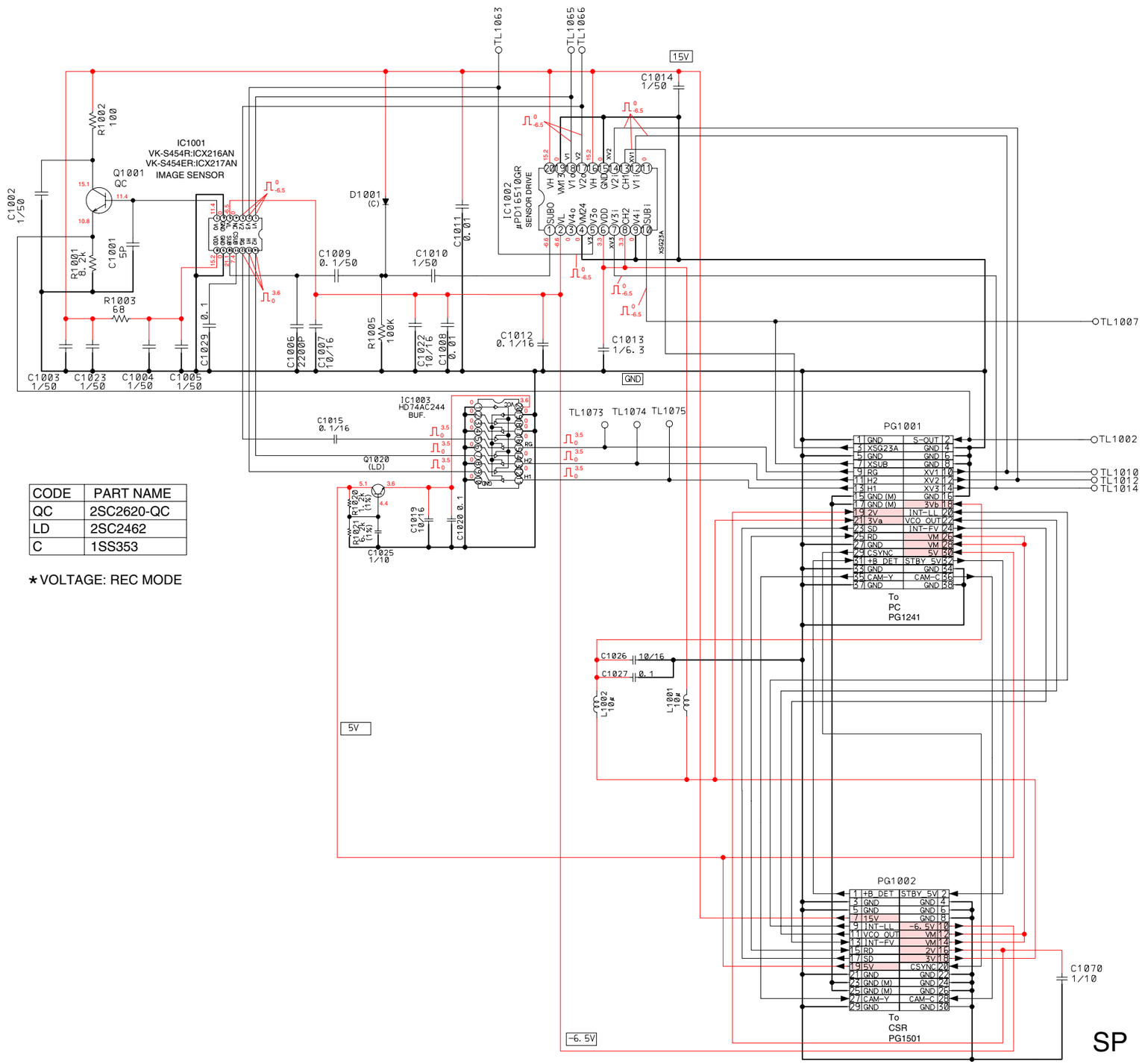
1 Wiring Diagram



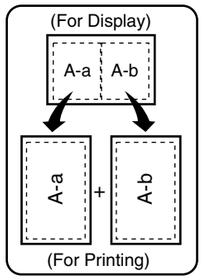
2 Schematic Diagrams
2-1 SP Schematic Diagram

CODE	PART NAME
QC	2SC2620-QC
LD	2SC2462
C	1SS353

*VOLTAGE: REC MODE



2-2 PC Schematic Diagram (For Display)



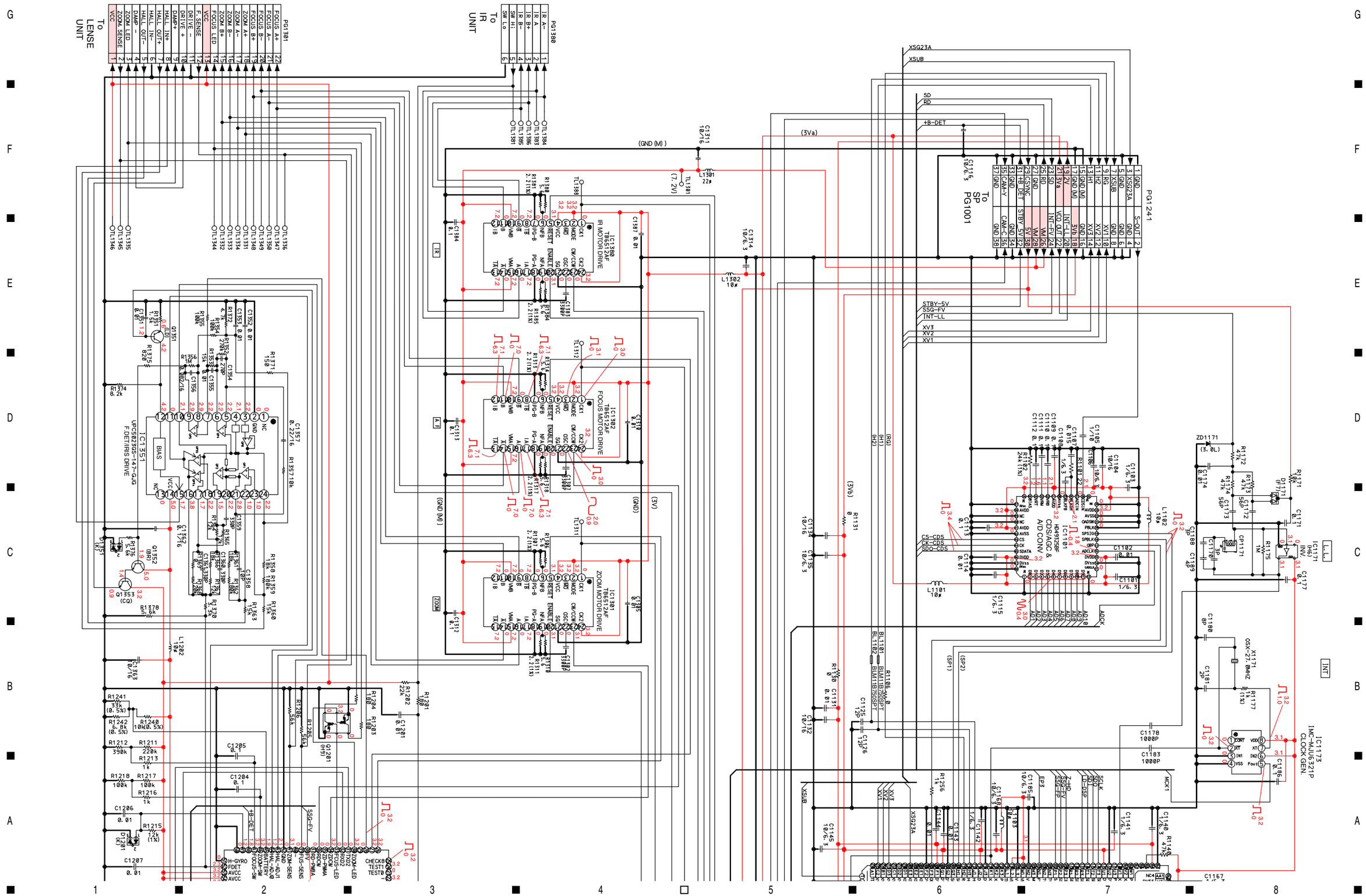
CODE	PART NAME
AR	2SB1462
BR	2SC2412K
CQ	2SC2411K
H6	TC7SHU04FU
LD	2SC2462LD
H9	UMH9N
F7	KV1470
K	DA221
MO	MA132WA
3.0L	MA3030L

*VOLTAGE: REC MODE

PC

2-2-1 PC Schematic Diagram (For Printing)

A-a



2-2-2 PC Schematic Diagram (For Printing)

A-b

PC

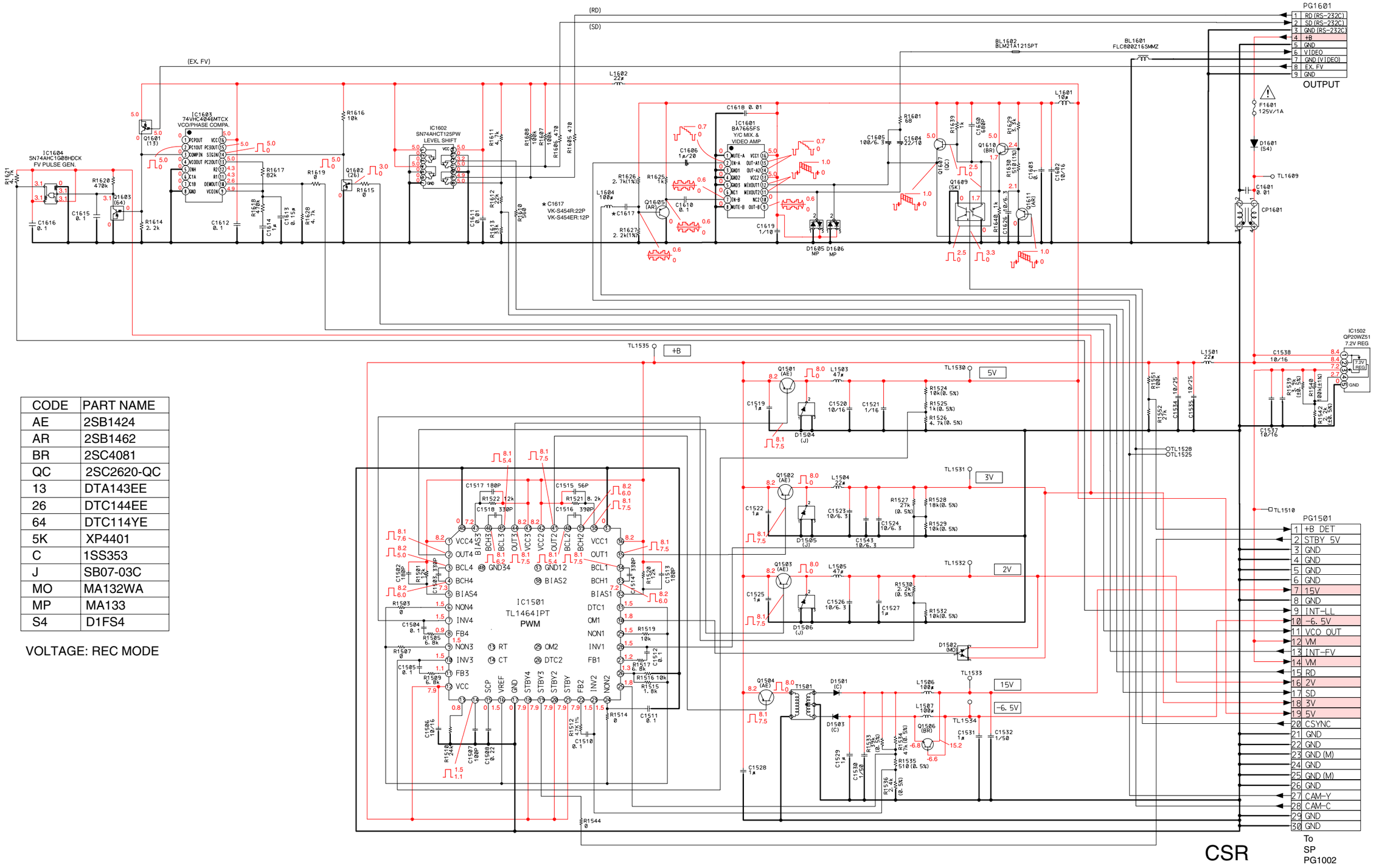
CODE	PART NAME
AR	2SB1462
BR	2SC2412K
CQ	2SC2411K
H6	TC7SHU04FU
LD	2SC2462LD
H9	UMH9N
F7	KV1470
K	DA221
MO	MA132WA
3.0L	MA3030L

*VOLTAGE: REC MODE

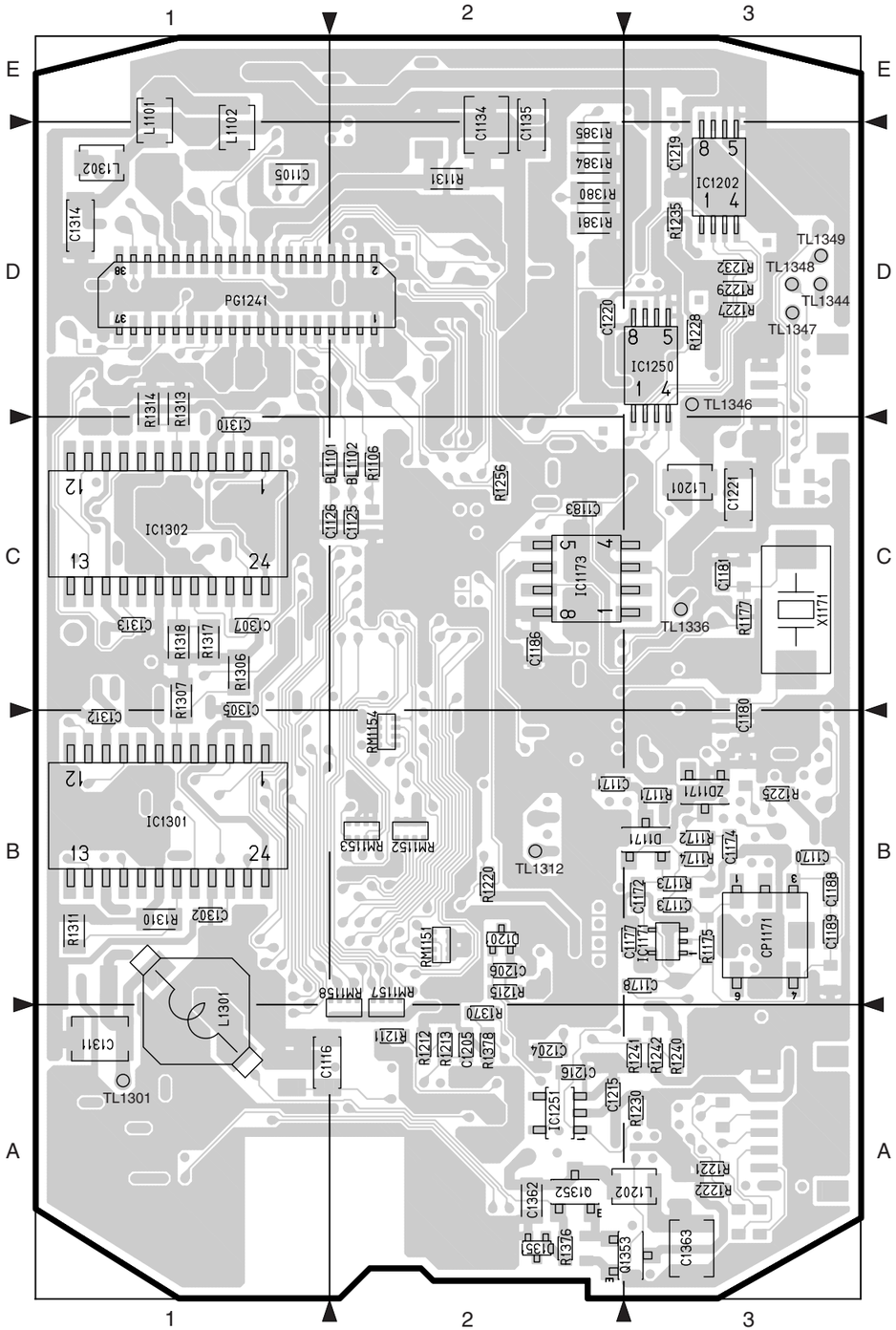
2-3 CSR Schematic Diagram

CODE	PART NAME
AE	2SB1424
AR	2SB1462
BR	2SC4081
QC	2SC2620-QC
13	DTA143EE
26	DTC144EE
64	DTC114YE
5K	XP4401
C	1SS353
J	SB07-03C
MO	MA132WA
MP	MA133
S4	D1FS4

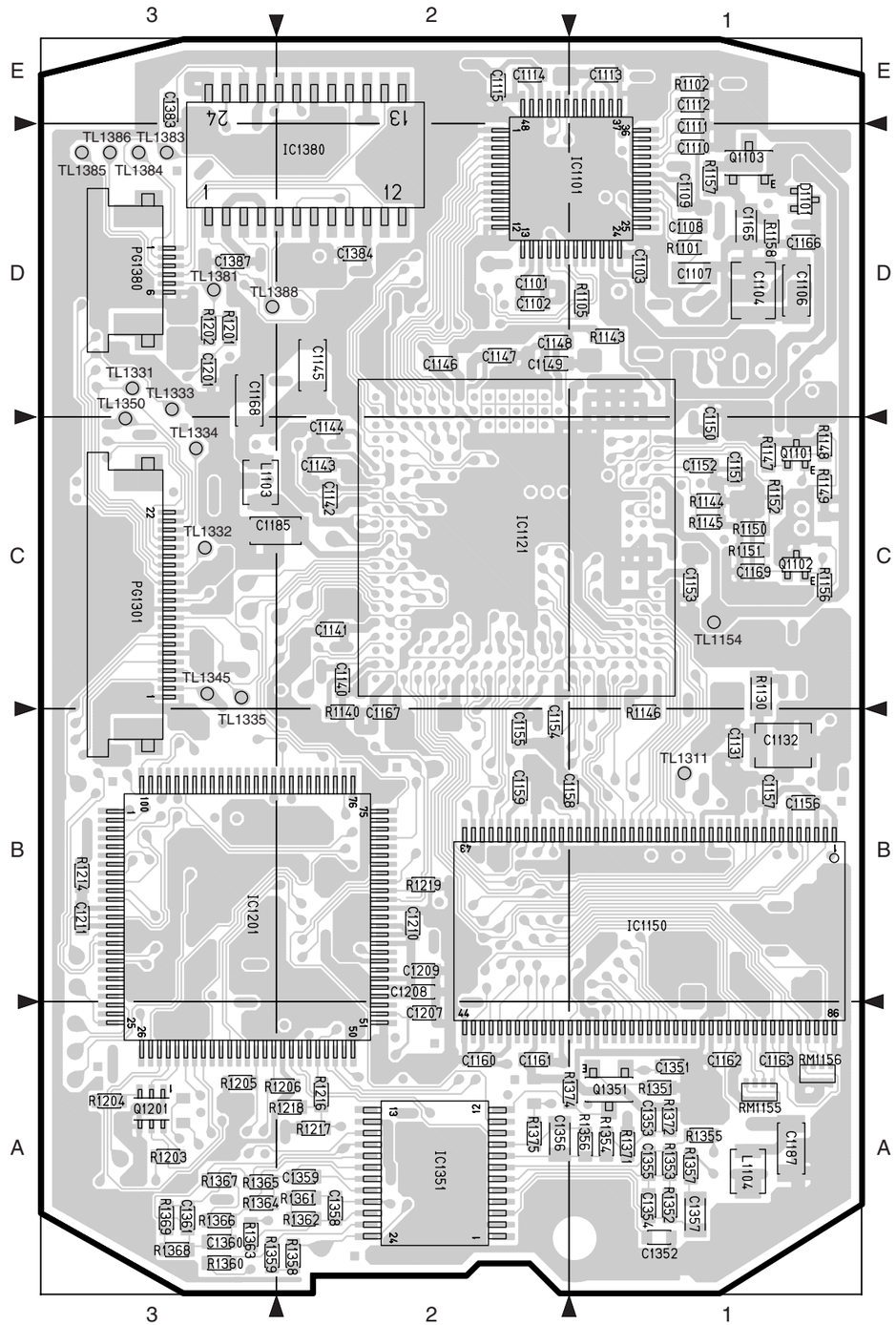
VOLTAGE: REC MODE



3 Circuit Board Diagrams
3-1 PC Circuit Board Diagram

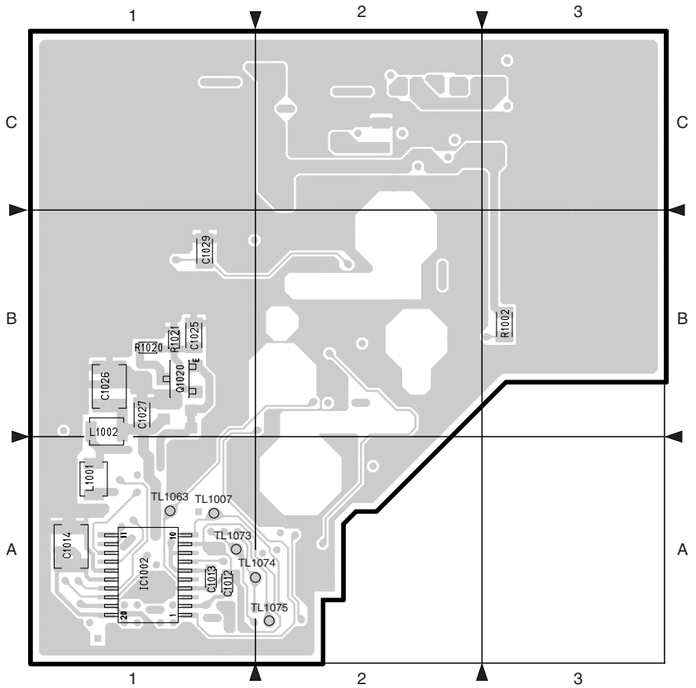


PC -SIDE A-
[PATTERN No.JA2185-2]

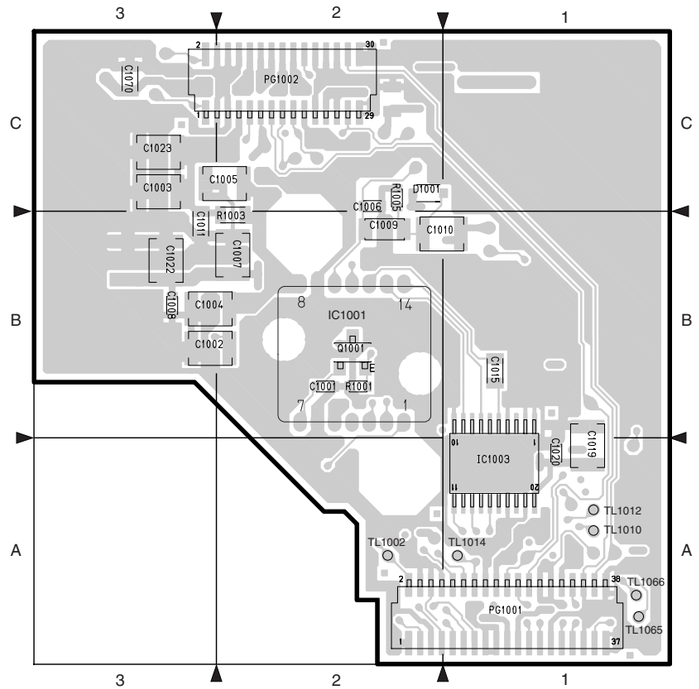


PC -SIDE B-
[PATTERN No.JA2185-2]

3-2 SP Circuit Board Diagram

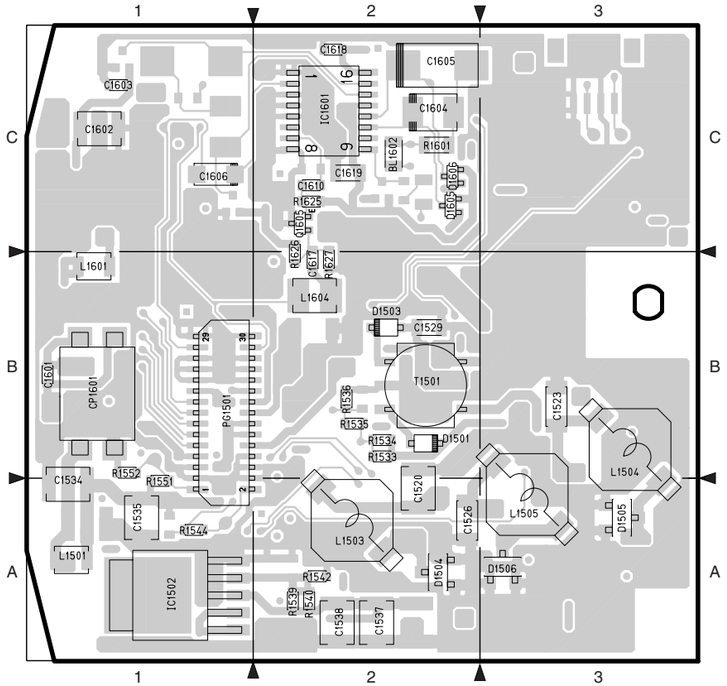


SP -SIDE A-
[PATTERN No.JA2185-2]

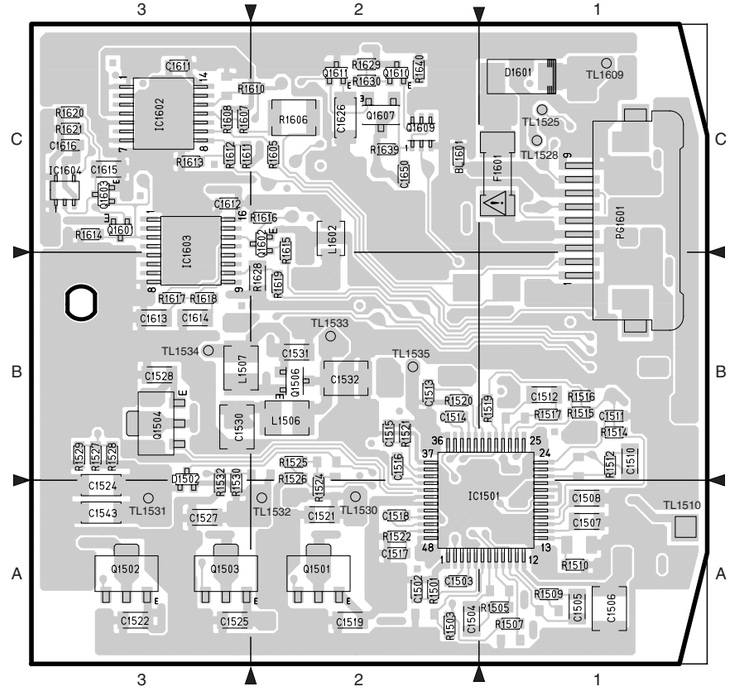


SP -SIDE B-
[PATTERN No.JA2185-2]

3-3 CSR Circuit Board Diagram



CSR -SIDE A-
[PATTERN No.JA2185-2]



CSR -SIDE B-
[PATTERN No.JA2185-2]

3-4 Identification of Parts Location

PC

Symbol No.	Parts Location
BL	
BL1101	A-2C
BL1102	A-2C
C	
C1101	B-2D
C1102	B-2D
C1103	B-1D
C1104	B-1D
C1105	A-1D
C1106	B-1D
C1107	B-1D
C1108	B-1D
C1109	B-1D
C1110	B-1D
C1111	B-1D
C1112	B-1E
C1113	B-1E
C1114	B-2E
C1115	B-2E
C1116	A-1A
C1125	A-2C
C1126	A-2C
C1131	B-1B
C1132	B-1B
C1134	A-2D
C1135	A-2D
C1140	B-2C
C1141	B-2C
C1142	B-2C
C1143	B-2C
C1144	B-2C
C1145	B-2D
C1146	B-2D
C1147	B-2D
C1148	B-2D
C1149	B-2D
C1150	B-1C
C1151	B-1C
C1152	B-1C
C1153	B-1C
C1154	B-2B
C1155	B-2B
C1156	B-1B
C1157	B-1B
C1158	B-1B
C1159	B-2B
C1160	B-2A
C1161	B-2A
C1162	B-1A
C1163	B-1A
C1165	B-1D
C1166	B-1D
C1167	B-2B
C1168	B-3D
C1169	B-1C
C1170	A-3B
C1171	A-2B
C1172	A-3B

Symbol No.	Parts Location
C1173	A-3B
C1174	A-3B
C1177	A-3B
C1178	A-3B
C1180	A-3B
C1181	A-3C
C1183	A-2C
C1185	B-3C
C1186	A-2C
C1187	B-1A
C1188	A-3B
C1189	A-3B
C1201	B-3D
C1204	A-2A
C1205	A-2A
C1206	A-2B
C1207	B-2A
C1208	B-2B
C1209	B-2B
C1210	B-2B
C1211	B-3B
C1215	A-2A
C1216	A-2A
C1219	A-3D
C1220	A-2D
C1221	A-3C
C1302	A-1B
C1305	A-1B
C1307	A-1C
C1310	A-1C
C1311	A-1A
C1312	A-1B
C1313	A-1C
C1314	A-1D
C1351	B-1A
C1352	B-1A
C1353	B-1A
C1354	B-1A
C1355	B-1A
C1356	B-2A
C1357	B-1A
C1358	B-2A
C1359	B-2A
C1360	B-3A
C1361	B-3A
C1362	A-2A
C1363	A-3A
C1383	B-3E
C1384	B-2D
C1387	B-3D
CP	
CP1171	A-3B
D	
D1101	B-1D
D1171	A-3B
D1201	A-2B
D1351	A-2A
IC	

Symbol No.	Parts Location
IC1101	B-1D
IC1121	B-2C
IC1150	B-1B
IC1171	A-3B
IC1173	A-2C
IC1201	B-3B
IC1202	A-3D
IC1250	A-3D
IC1251	A-2A
IC1301	A-1B
IC1302	A-1C
IC1351	B-2A
IC1380	B-2D
L	
L1101	A-1D
L1102	A-1D
L1103	B-3C
L1104	B-1A
L1201	A-3C
L1202	A-3A
L1301	A-1A
L1302	A-1D
PG	
PG1241	A-1D
PG1301	B-3C
PG1380	B-3D
Q	
Q1101	B-1C
Q1102	B-1C
Q1103	B-1D
Q1201	B-3A
Q1351	B-1A
Q1352	A-2A
Q1353	A-3A
R	
R1101	B-1D
R1102	B-1E
R1105	B-1D
R1106	A-2C
R1130	B-1C
R1131	A-2D
R1140	B-2B
R1143	B-1D
R1144	B-1C
R1145	B-1C
R1146	B-1B
R1147	B-1C
R1148	B-1C
R1149	B-1C
R1150	B-1C
R1151	B-1C
R1152	B-1C
R1156	B-1C
R1157	B-1D
R1158	B-1D
R1171	A-3B
R1172	A-3B
R1173	A-3B

Symbol No.	Parts Location
R1174	A-3B
R1175	A-3B
R1177	A-3C
R1201	B-3D
R1202	B-3D
R1203	B-3A
R1204	B-3A
R1205	B-3A
R1206	B-2A
R1211	A-2A
R1212	A-2A
R1213	A-2A
R1214	B-3B
R1215	A-2B
R1216	B-2A
R1217	B-2A
R1218	B-2A
R1219	B-2B
R1220	A-2B
R1221	A-3A
R1222	A-3A
R1225	A-3B
R1227	A-3D
R1228	A-3D
R1229	A-3D
R1230	A-3A
R1232	A-3D
R1235	A-3D
R1240	A-3A
R1241	A-3A
R1242	A-3A
R1256	A-2C
R1306	A-1C
R1307	A-1C
R1310	A-1B
R1311	A-1B
R1313	A-1D
R1314	A-1D
R1317	A-1C
R1318	A-1C
R1351	B-1A
R1352	B-1A
R1353	B-1A
R1354	B-1A
R1355	B-1A
R1356	B-1A
R1357	B-1A
R1358	B-2A
R1359	B-3A
R1360	B-3A
R1361	B-2A
R1362	B-2A
R1363	B-3A
R1364	B-3A
R1365	B-3A
R1366	B-3A
R1367	B-3A
R1368	B-3A

Symbol No.	Parts Location
R1369	B-3A
R1370	A-2A
R1371	B-1A
R1372	B-1A
R1374	B-1A
R1375	B-2A
R1376	A-2A
R1378	A-2A
R1380	A-2D
R1381	A-2D
R1384	A-2D
R1385	A-2D
RM	
RM1151	A-2B
RM1152	A-2B
RM1153	A-2B
RM1154	A-2B
RM1155	B-1A
RM1156	B-1A
RM1157	A-2A
RM1158	A-2A
TL	
TL1154	B-1C
TL1301	A-1A
TL1311	B-1B
TL1312	A-2B
TL1331	B-3D
TL1332	B-3C
TL1333	B-3D
TL1334	B-3C
TL1335	B-3C
TL1336	A-3C
TL1344	A-3D
TL1345	B-3C
TL1346	A-3D
TL1347	A-3D
TL1348	A-3D
TL1349	A-3D
TL1350	B-3D
TL1381	B-3D
TL1383	B-3D
TL1384	B-3D
TL1385	B-3D
TL1386	B-3D
TL1388	B-3D
X	
X1171	A-3C
ZD	
ZD1171	A-3B

SP

Symbol No.	Parts Location
C	
C1001	B-2B
C1002	B-3B
C1003	B-3C
C1004	B-3B
C1005	B-2C
C1006	B-2C
C1007	B-2B
C1008	B-3B
C1009	B-2B
C1010	B-2B
C1011	B-3B
C1012	A-1A
C1013	A-1A
C1014	A-1A
C1015	B-1B
C1019	B-1A
C1020	B-1A
C1022	B-3B
C1023	B-3C
C1025	A-1B
C1026	A-1B
C1027	A-1B
C1029	A-1B
C1070	B-3C
D	
D1001	B-2C
IC	
IC1001	B-2B
IC1002	A-1A
IC1003	B-1A
L	
L1001	A-1A
L1002	A-1B
PG	
PG1001	B-1A
PG1002	B-2C
Q	
Q1001	B-2B
Q1020	A-1B
R	
R1001	B-2B
R1002	A-3B
R1003	B-2B
R1005	B-2C
R1020	A-1B
R1021	A-1B
TL	
TL1002	B-2A
TL1007	A-1A
TL1010	B-1A
TL1012	B-1A
TL1014	B-1A
TL1063	A-1A
TL1065	B-1A
TL1066	B-1A
TL1073	A-1A
TL1074	A-2A

Symbol No.	Parts Location
TL1075	A-2A

CSR

Symbol No.	Parts Location
BL	
BL1601	B-2C
BL1602	A-2C
C	
C1502	B-2A
C1503	B-2A
C1504	B-2A
C1505	B-1A
C1506	B-1A
C1507	B-1A
C1508	B-1A
C1510	B-1B
C1511	B-1B
C1512	B-1B
C1513	B-2B
C1514	B-2B
C1515	B-2B
C1516	B-2B
C1517	B-2A
C1518	B-2A
C1519	B-2A
C1520	A-2A
C1521	B-2A
C1522	B-3A
C1523	A-3B
C1524	B-3A
C1525	B-3A
C1526	A-2A
C1527	B-3A
C1528	B-3B
C1529	A-2B
C1530	B-3B
C1531	B-2B
C1532	B-2B
C1534	A-1A
C1535	A-1A
C1537	A-2A
C1538	A-2A
C1543	B-3A
C1601	A-1B
C1602	A-1C
C1603	A-1C
C1604	A-2C
C1605	A-2C
C1606	A-1C
C1610	A-2C
C1611	B-3C
C1612	B-3C
C1613	B-3B
C1614	B-3B
C1615	B-3C
C1616	B-3C
C1617	A-2B
C1618	A-2C
C1619	A-2C
C1626	B-2C
C1650	B-2C
CP	

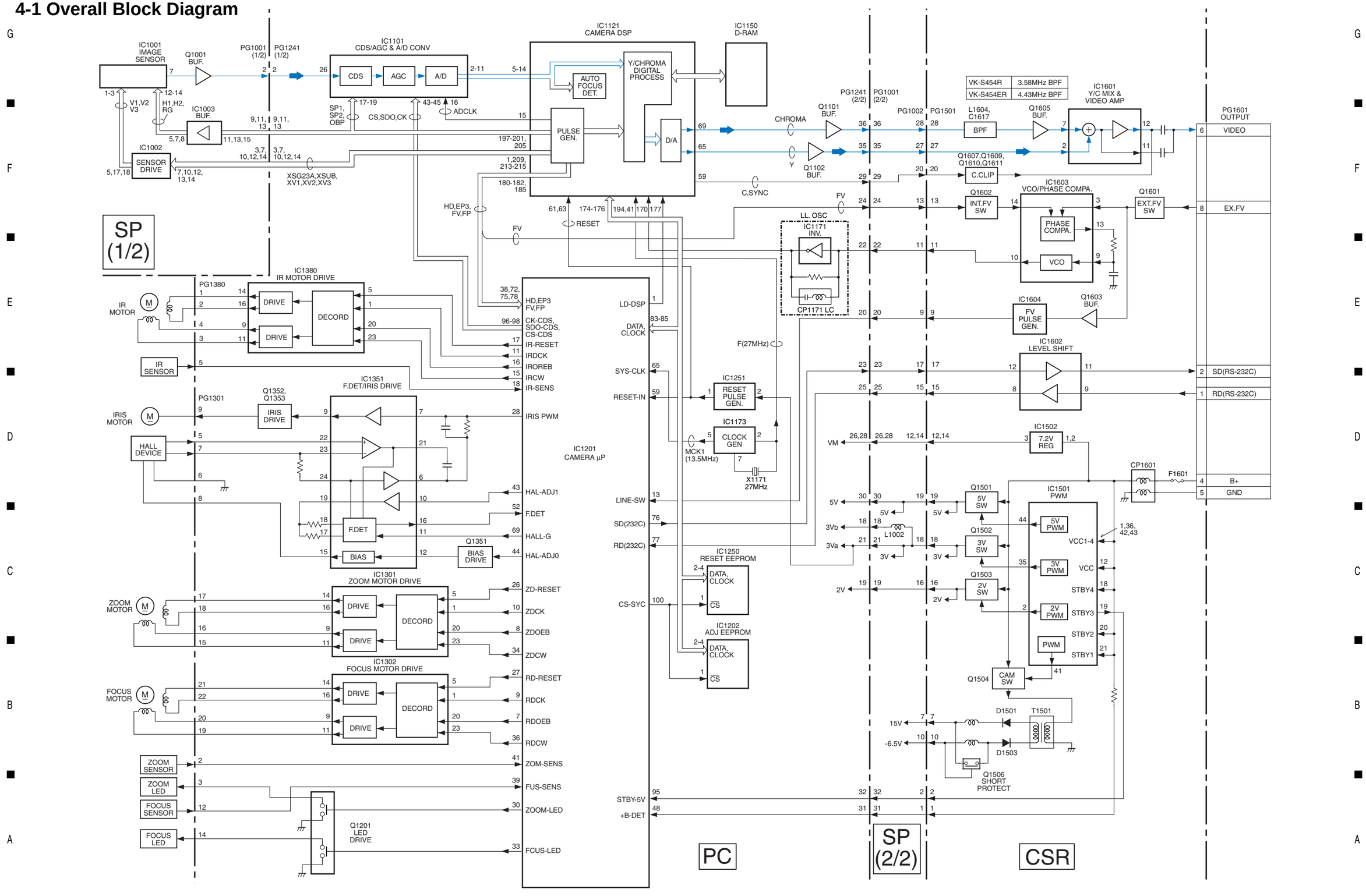
Symbol No.	Parts Location
CP1601	A-1B
D	
D1501	A-2B
D1502	B-3A
D1503	A-2B
D1504	A-2A
D1505	A-3A
D1506	A-3A
D1601	B-1C
D1605	A-2C
D1606	A-2C
F	
F1601	B-1C
IC	
IC1501	B-1A
IC1502	A-1A
IC1601	A-2C
IC1602	B-3C
IC1603	B-3C
IC1604	B-3C
L	
L1501	A-1A
L1503	A-2A
L1504	A-3B
L1505	A-3A
L1506	B-2B
L1507	B-3B
L1601	A-1B
L1602	B-2C
L1604	A-2B
PG	
PG1501	A-1B
PG1601	B-1C
Q	
Q1501	B-2A
Q1502	B-3A
Q1503	B-3A
Q1504	B-3B
Q1506	B-2B
Q1601	B-3C
Q1602	B-2C
Q1603	B-3C
Q1605	A-2C
Q1607	B-2C
Q1609	B-2C
Q1610	B-2C
Q1611	B-2C
R	
R1501	B-2A
R1503	B-2A
R1505	B-1A
R1507	B-1A
R1509	B-1A
R1510	B-1A
R1512	B-1B
R1514	B-1B
R1515	B-1B
R1516	B-1B

Symbol No.	Parts Location
R1517	B-1B
R1519	B-1B
R1520	B-2B
R1521	B-2B
R1522	B-2A
R1524	B-2A
R1525	B-2B
R1526	B-2B
R1527	B-3B
R1528	B-3B
R1529	B-3B
R1530	B-3A
R1532	B-3A
R1533	A-2B
R1534	A-2B
R1535	A-2B
R1536	A-2B
R1539	A-2A
R1540	A-2A
R1542	A-2A
R1544	A-1A
R1551	A-1A
R1552	A-1B
R1601	A-2C
R1605	B-2C
R1606	B-2C
R1607	B-3C
R1608	B-3C
R1610	B-3C
R1611	B-3C
R1612	B-3C
R1613	B-3C
R1614	B-3C
R1615	B-2C
R1616	B-2C
R1617	B-3B
R1618	B-3B
R1619	B-2B
R1620	B-3C
R1621	B-3C
R1625	A-2C
R1626	A-2B
R1627	A-2B
R1628	B-2B
R1629	B-2C
R1630	B-2C
R1639	B-2C
R1640	B-2C
T	
T1501	A-2B
TL	
TL1510	B-1A
TL1525	B-1C
TL1528	B-1C
TL1530	B-2A
TL1531	B-3A
TL1532	B-2A
TL1533	B-2B

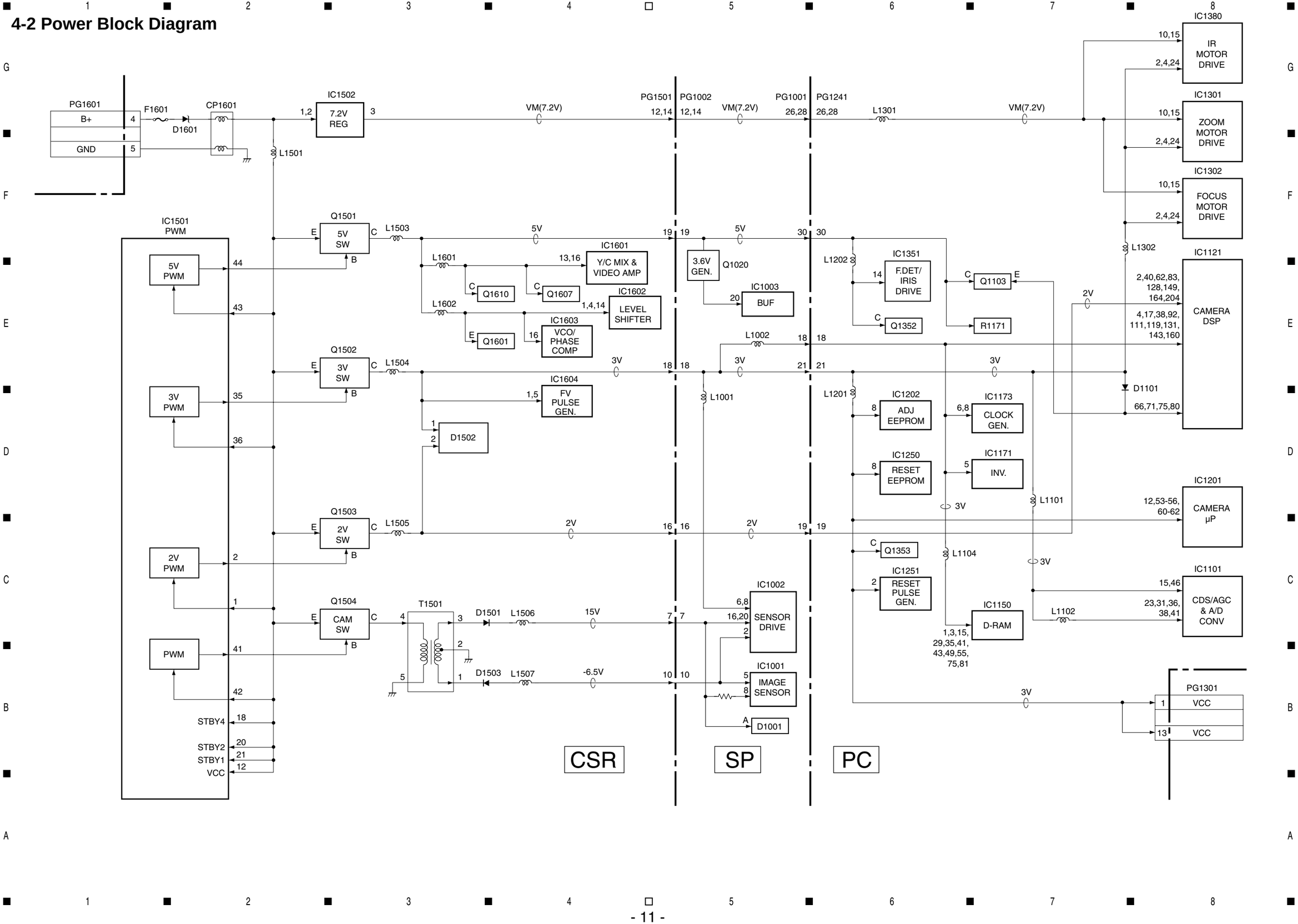
Symbol No.	Parts Location
TL1534	B-3B
TL1535	B-2B
TL1609	B-1C

4. Block Diagrams

4-1 Overall Block Diagram



4-2 Power Block Diagram



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